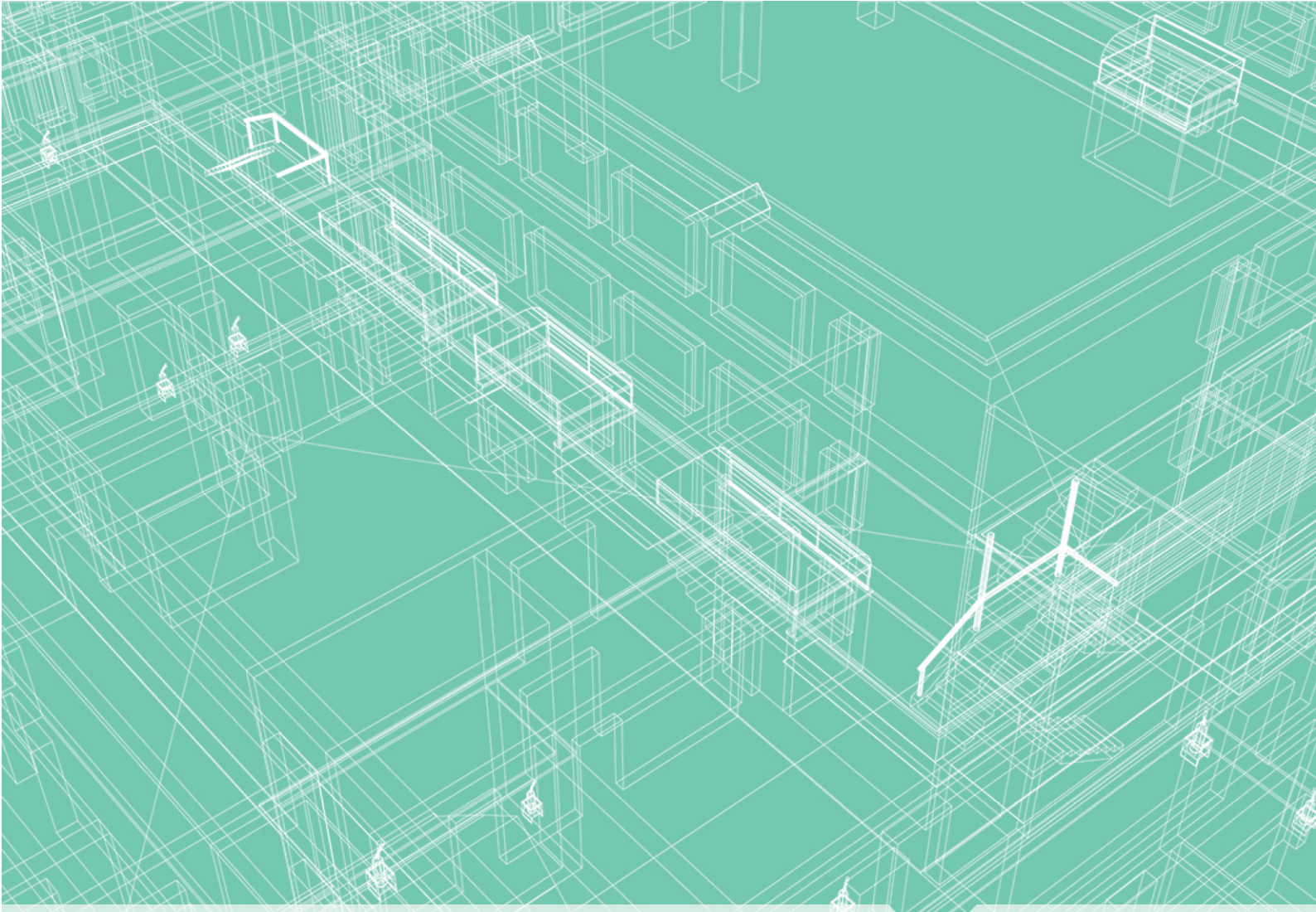


ESD REPORT

PARRAMATTA LEAGUES CLUB HOTEL DEVELOPMENT

ESD SERVICES

JHA

JHASERVICES.COM

This report is prepared for the nominated recipient only and relates to the specific scope of work and agreement between JHA and the client (the recipient). It is not to be used or relied upon by any third party for any purpose.

DOCUMENT CONTROL SHEET

Project Number	210359
Project Name	Parramatta Leagues Club Hotel
Description	ESD Report
Key Contact	Roger Sam

Prepared By

Company	JHA
Address	Level 23, 101 Miller Street, North Sydney NSW 2060
Phone	61-2-9437 1000
Email	Roger.Sam@jhaengineers.com.au
Website	www.jhaservices.com
Author	Roger Sam
Checked	Lawrence Yu
Authorised	

Revision History

Issued To	Revision and Date								
Jason Perica	REV	Draft							
	DATE	10/09/2021							
	REV	A							
	DATE	6/10/2021							
	REV								
	DATE								
	REV								
	DATE								
	REV								
	DATE								

CONTENTS

EXECUTIVE SUMMARY

The following Ecological Sustainable Design (ESD) report identifies and summarises the key ESD initiatives that will make up the overall approach for the sustainable design of Parramatta Leagues Club Hotel, located to the rear of Parramatta Leagues Club, 1 Eels Place, Parramatta NSW 2150. The development team is committed to maintaining a focus on sustainability throughout the phases of design, construction and operation/occupancy.

In summary, the proposed development is committed to the following ESD targets:

- National Construction Code (NCC) 2019 Section J – Energy Efficiency;
- Green Star Design & As-built equivalency v1.3 – **5 Star Rating**
- NABERS Energy for Hotels – **5 Star Rating**

This report demonstrates compliance with the Secretary's Environmental Assessment Requirements (SEARs) that apply to the project and has been prepared to accompany a State Significant Development (SSD) application to the NSW Department of Planning, Industry and Environment (DPIE). This report should be read in conjunction with the architectural design drawings and other consultant design reports submitted as part of the application.

The ESD objects of this project is to encourage a balanced approach to designing new facilities for the project; to be resource-efficient, cost-effective in construction and operation; and to deliver enhanced sustainability benefits with respect to impacts on the environment and on the health and well-being of the occupancies and visitors whilst providing the best possible facilities for the constructive environment.

This report accompanies a Response to Submissions addressing issues raised by NSW DPIE and City of Parramatta Council following previous submission. Section 1.4 of this document contains a table identifying the previous issues raised and how they have been addressed.

The proposed key ESD initiatives for the proposed development are listed below:

- Sufficient exposure to daylight
- Appropriate construction and glazing selection
- Energy-efficient air-conditioning systems with control strategy and thermal comfort tuning
- External horizontal & vertical shading devices
- Efficient lighting systems
- High WELS rated water fixtures
- Sustainable materials
- Rainwater capture and reuse
- Green Walls & Green Roofs

This report references the **Design Report by HASSELL (06/08/2021)** –
"SSD 8800 – Response to DPE Submissions – Revised Design Submission" for figures and extracts.

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposed hotel development is located at 1 Eels Place, Parramatta NSW 2150. The local council is City of Parramatta, and the development is within a private recreation development zone. Comprising of 17 stories plus basement, it will contain hotel accommodation, function, and leisure facilities.

1.2 SITE LOCATION

The site is located directly behind, to the southwest of the existing Parramatta Leagues Club building (1 Eels Pl, Parramatta NSW 2150).

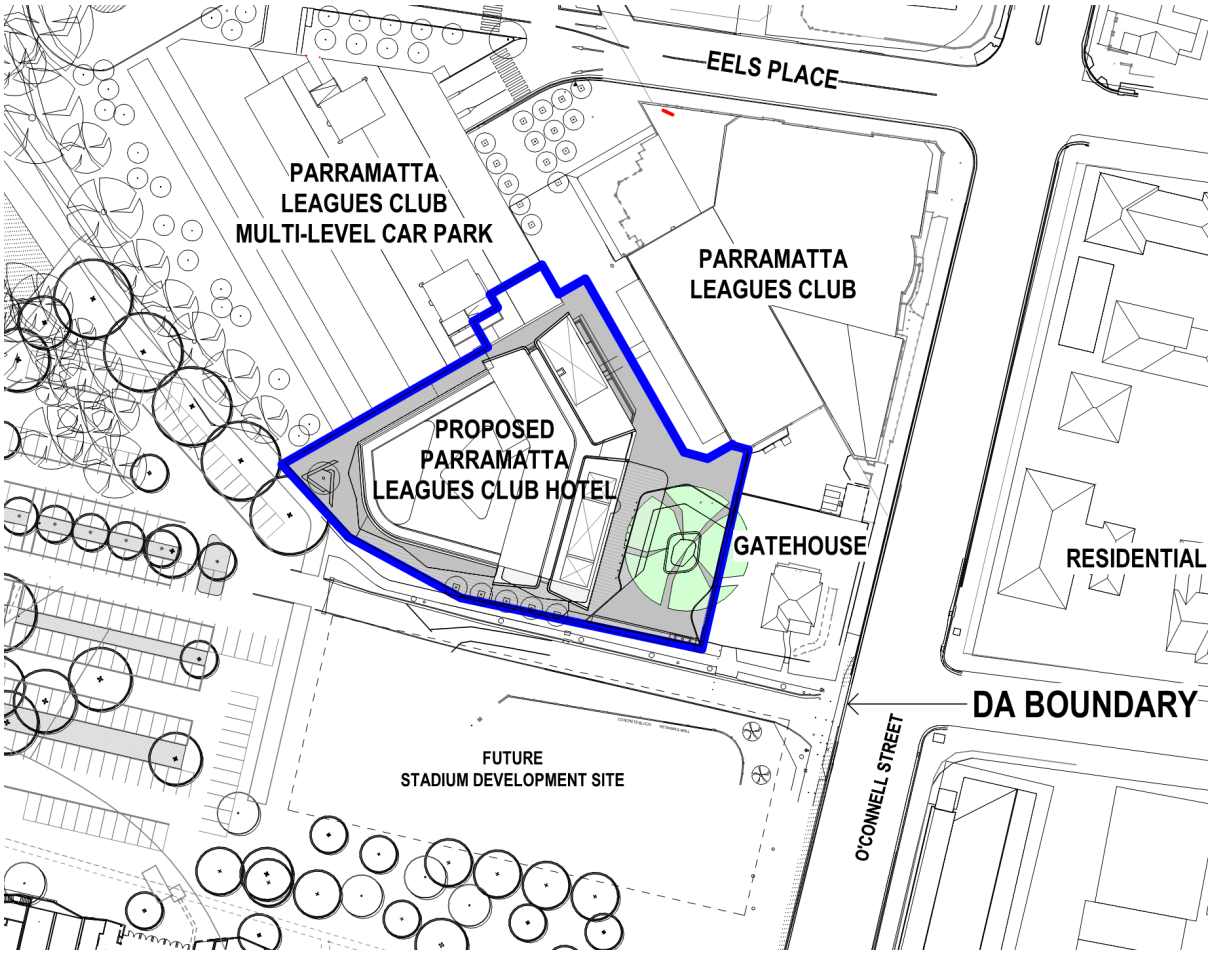


Figure 1 – Site Location (Hassell, Design Report)

1.3 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARS)

The Secretary's Environmental Assessment Requirements (SEARs) for the development were issued on 6 November 2017 setting out the documentary and reporting requirements for the preparation of the EIS/SSDA. This report acknowledges the SEARs prepared by the Secretary which notes the following in Section 11 of the document:

11. ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD)

- Detail how the best practice ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design, construction and ongoing operation phases of the development.
- Describe the measures to be implemented to minimise consumption of resources, energy and water, including details of alternative energy and water supplies, rainwater harvesting, proposed end uses of potable and non-potable water, demonstration of water sensitive urban design and any water conservation measures.

In accordance with the above SEARs requirements, the development will implement a holistic and integrated approach to ESD, maximising passive opportunities with the selective application of modern technology where appropriate. Initiatives will be chosen with due regard to whole of lifecycle cost benefits to the new facilities.

1.4 RESPONSE TO DPIE LETTER AND COUNCIL SUBMISSION

The table below identifies the issues raised by NSW DPIE and Council following submission along with the respective response.

Key Points of Interest	Response
DPIE: ▪ *Identify how the measures outlined in ESD Report will be incorporated into the development, with detail to be shown on plans where relevant* ▪ *The ESD report references green walls and green roofs, but it is unclear where these are being incorporated into the proposed design*	▪ Location of ESD measures provided where appropriate ▪ Location of green walls and roofs provided - See Fig. 15 & 16
City of Parramatta Council: ▪ The application does not meet part 11 of the SEARs ▪ *The provided ESD report has not outlined how best practice ESD principles will be incorporated or how these measures are to be implemented* ▪ *The ESD reports only recommends strategies for potential adoption and there is no evidence of any ESD initiatives accommodated in either the architectural design or the cost plan* ▪ *The architectural drawings indicate interstitial timber louvres within all glazing and operable windows to the hotel rooms* ▪ *(Timber Louvres) provision should be referenced within the ESD report* ▪ *Council considers the proposed 4 Green Star insufficient to meet the SEAR requirements and is concerned the proposal has not addressed resource consumption, energy and water targets, energy alternatives, water supply, rainwater harvesting, proposed end uses of potable and non-potable water, demonstration of water sensitive urban design and any water conservation measures* ▪ *Accordingly, the ESD report must be updated to incorporate the above matters, ESD related design elements and include a NABERS Energy commitment for Hotels rating greater than 5 Star*	▪ Part 11 of SEARSs addressed in Section 2& 3 ▪ ESD principles updated to reflect their implementation in the development where appropriate ▪ Timber Louvres referenced in ESD report ▪ Project benchmarked against 5 Green Star. ESD report addresses mentioned topics in relation to the proposed development ▪ Report updated to include NABERS 5 Star Energy Rating Commitment for Hotels

1.5 ESD TARGETS & COMMITMENTS

The ESD initiatives outlined within this document have been compiled based on the following regulation, design tools, and design guidelines:

- National Construction Code (NCC) 2019 Section J – Energy Efficiency;
- Green Star Design & As-built equivalency v1.3 – 5 Star Rating
- NABERS Energy for Hotels – 5 Star Rating

The above SEARS requirements are addressed in the subsequent section of this report.

2 PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The principles of Ecologically Sustainable Development as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 have been incorporated into the design and on-going operation phases of the development as follows:

2.1 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.

Project response:

This development is being designed in accordance with a wide range of ESD goals that pertain to the design, construction and operational stages. The development team will ensure that the building minimises the impact on the environment in the areas of energy, water and materials. A strong focus on passive design, building fabric, health and well-being, electrical and mechanical strategies, including the use of renewable energy significantly contributes towards minimising climate change impacts.

2.2 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.

Project response:

This development will not cause any significant impact on the health, diversity and productivity of the environment. The project will contribute to a lively community environment and add architectural interest to the surrounding area.

2.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

Namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration

Project response:

This development is proposed on a brown field site (existing car park) adjacent to the Parramatta Leagues Club, Parramatta parkland, a main road, in an urban environment in a western suburb of Sydney. Conservation of the biodiversity and ecological integrity of the surrounding Parramatta parkland where the grey-headed flying fox colony can be found will be a high priority throughout the planning design, construction and operation of the development. The ecological impacts of this development have been addressed in the Biodiversity Development Assessment Report. Living green walls located on hotel room balconies will help improve the biological and ecological impacts of the development.

2.4 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.

Project response:

The proposed development is benchmarking its environmental performance to equivalent to a 5 star Green Star standard. The development design that will achieve this rating will reduce pollutants and increase sustainability by optimising building fabric, HVAC system and lighting design. Certified recycled and reused materials, as well as materials with low embodied energy, preferred over others.

3 SUSTAINABLE DESIGN FRAMEWORK

The sustainable design framework for this development aims to incorporate the best practice design initiatives and ESD principles to the development. The ESD initiatives and targets outlined within this framework have been compiled based on the following:

- National Construction Code (NCC) 2019 Section J – Energy Efficiency;
- Green Star Design & As-built equivalency v1.3 – **5 Star Rating**
- NABERS Energy for Hotels – **5 Star Rating**

3.1 BUILDING ENVELOPE

Intelligent design and material selection ensure that thermal comfort is not entirely achieved by a mechanical means. Passive design initiatives such as performance glazing, shading and use of insulation reduces demand on the mechanical air conditioned systems resulting in a reduction of energy consumption and greenhouse gas emissions.

3.1.1 BUILDING ENVELOPE PERFORMANCE

The building fabric is designed to meet or exceed the NCC 2019 Section J requirements for building envelope. Thermal breaks are incorporated into walls, floors and roofs where appropriate to ensure a continuous thermal barrier on the building envelope, reducing the flow of thermal energy between conductive materials.

A preliminary assessment under the JV3 pathway to show compliance has been carried out during the schematic design stage of the project. The indicative results on insulation material quantity and glazing specifications demonstrating compliance with NCC 2019 Section J are provided below.

3.1.1.1 Building Fabric

The preliminary minimum performance requirements obtained under JV3 provision for the development (Class 3) at the proposed location (Climate Zone 6) as per the NCC Section J – Energy Efficiency are:

Building Elements	Indicative NCC 2019 Requirements
Envelope Roof/Ceiling	Total R-Value of 3.2 (Downwards, Solar absorptance of the upper surface of a roof must not be more than 0.45)
Envelope Walls	Total R-Value of 2.8
Envelope Floors	Total R-Value of 2.0 (Downwards)

Note: The impact of thermal bridging must be considered within total R-value calculation under NCC 2019.

This necessitates the use of insulation in the walls, floor and roof for both the new building fabrics and extensions or alterations to new fabric constructions. Insulation reduces heat flow and consequent heat loss in winter and heat gain in summer. This minimises the heating and cooling load demand on the air conditioning systems. Light coloured roof material with a low solar absorptance (SA) will isolate more sunlight and reduce summer heat gain.

3.1.1.2 Glazing

Glazing is a major source of unwanted heat gain in the summer and can cause significant heat loss in the winter due to its low insulation performance. It is thus recommended that windows are high-performance glazing systems. Performance glazing substantially reduces heat transmission. This particularly reduces heat loss in winter, therefore, internal heat gain from equipment, lighting and people are better contained. Also, performance glazing absorbs the infrared portion of sunlight and reduces the amount of heat transferred into the conditioned space. This will correspond to a reduction of both heating and cooling loads.

The building will comply with NCC 2019 Section J Energy Efficiency. The detailed Section J JV3 assessment will be carried out in the detailed design stage and a Section J statement of compliance to be provided for Construction Certificate. The values below are indicative.

Glazing Element	Window Assembly (Glass & Frame)		Description
	Total U-value	Total SHGC	
External Vertical Envelope Glazing	2.5-3.5	0.2-0.4	Double Glazed Performance Glazing (Subject to Detailed Design)

3.2 SHADING AND DAYLIGHTING

Solar access can enhance indoor environmental quality through access to daylighting and reduce lighting energy consumption. However, excessive solar access and hence, direct solar radiation heat can increase HVAC energy demand and can also cause thermal discomfort. The passive solar heating principle aims to prevent solar heat gain in the summer and harvest it in the winter for a free source of heating, whilst the Passive cooling principle prevents heat from entering the building during the summer months. These two strategies can conveniently take advantage of the site-specific solar access for optimised indoor environmental quality and reduction of HVAC energy demand through the use of tailored shadings.

Interstitial timber louvres are to be implemented on glazing areas of the hotel rooms providing effective shading on facades where occupants will be most exposed to solar radiation. These external horizontal shading devices can assist with reducing direct solar gains in summer (high altitude sun) while allowing passive solar heating in winter (low altitude sun). This design allows for enriched daylighting and greater access to external views. Additional daylighting reduces the reliance on artificial light and benefits alertness, mood and productivity.

LVR-02
DGU with interstitial timber louvres and aluminium framing

Finish: PaleTimber/Black

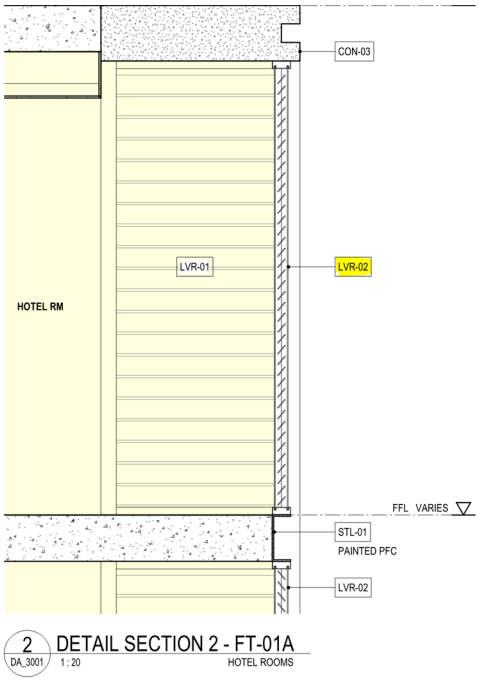


Figure 2 (Left)– Proposed Interstitial Timber Louvres (Hassell, Design Report)
Figure 3 (Right)– Detail Section of Hotel Room Façade Type-01A where Louvres are to be placed (Hassell, Design Report)

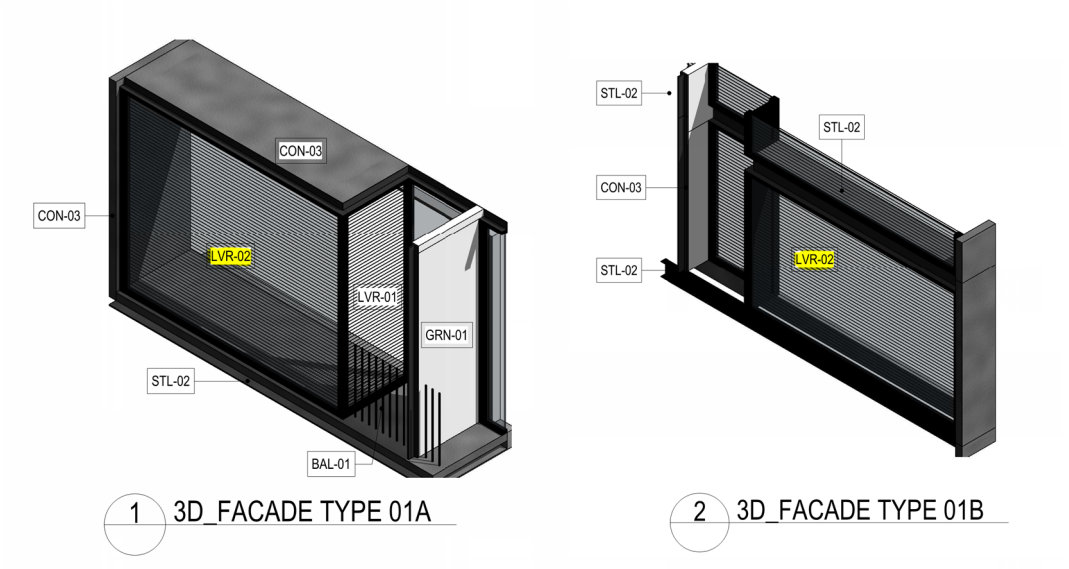
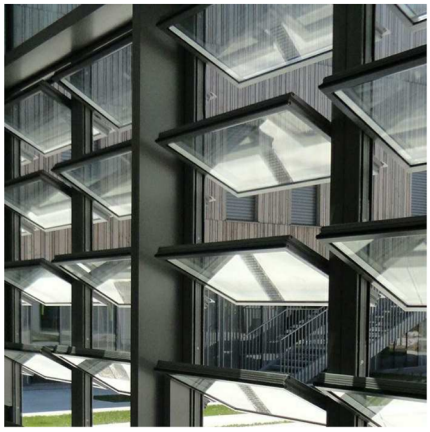


Figure 4 (Left)– Timber Louvres Location on Façade Type 01A for Hotel Rooms (Hassell, Design Report)
Figure 5 (Right)– Timber Louvres Location on Façade Type 01B for Hotel Rooms (Hassell, Design Report)

3.3 NATURAL VENTILATION

Adequate natural air movement makes an important contribution in creating a comfortable indoor environment and reducing the need for mechanical ventilation by carrying accumulated heat out and replacing it with cooler external air. This is important during the summer months where heat build-up within spaces can be quickly removed with the availability of a suitable breeze at the site.

Operable glazed louvres are to be implemented on the hotel rooms allowing natural ventilation for its occupants. The openable louvered glazing system has an optimal design for single sided ventilation through its high and low level openings, allowing cool fresh air to enter at low level and warm air to escape at high level. The mechanical systems installed are to be fitted with optimization controls to allow the system to turn off when the louvers are open.



CODE REFERENCE: LVR-01
DESCRIPTION: Operable Acoustic Glazed Louvres with Aluminium Framing

MATERIALS AND COLOURS: Finish: Clear/Black

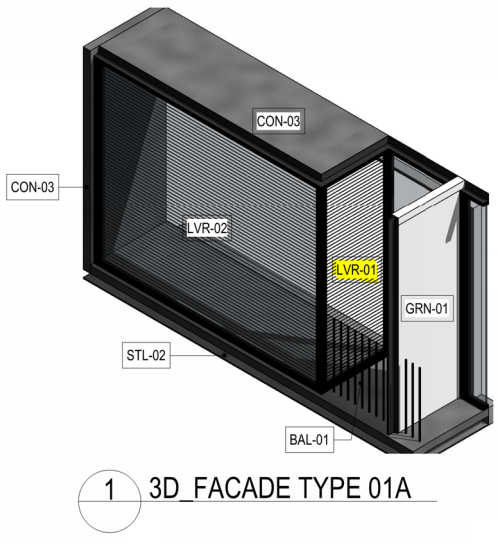


Figure 6 (Left) – Proposed Operable Glazed Lourves (Hassell, Design Report)
Figure 7 (Right)– 3D View of Louvres on Façade Type 01A for Hotel Rooms (Hassell, Design Report)

3.4 MECHANICAL ESD STRATEGIES

Each climate zone under the Building Code has different design and conditioning requirements to minimise energy use for heating and cooling. Good balance of heating and cooling reduction techniques are required to create an energy efficient development. The air-conditioning and ventilation systems shall be designed for the proposed development to achieve NABERS Energy rating of 5 Star.

3.4.1.1 Heating, cooling and ventilation systems

The air-condition and ventilation systems shall be designed to comply or exceed the minimum requirements of NCC 2019 Section J5 as well as driven by NABERS design requirement. The space conditioning system to be of efficiency and use energy recovery where possible. Control measure should be taken to optimise efficiency, passive heating and cooling, overall reducing energy consumption and operation costs. BMS and energy monitoring systems should be installed.

VRV/VRF (variable refrigerant volume/flow) Heat Recovery Systems or the like can provide simultaneous operation of cooling and heating to each individual space making it a viable air conditioning system for most areas. Each system will comprise of indoor fan coil unit (wall-mounted, ceiling cassette or ceiling ducted). The control of air conditioning system shall be designed to minimise energy consumption with a system such as an after hour push button for adjustable timer controller and/or motion detector controls. Further, high efficiency equipment for the HVAC system selected to further assist with energy conservation of the building.

All bathroom, storage, and general exhaust are to be naturally ventilated where possible, with mechanical ventilation required where necessary and provided with time controls (time switches or run-on timers as appropriate).

Ductwork systems designed to reduce system pressure losses to reduce fan motor power. This includes the selection of equipment for reduced coil and fittings drop and being generous with ductwork sizes to reduce friction losses.

Further, a centralised control system to monitor and control all mechanical services with the building. The system will allow building management to interrogate system usage, allow for programming of AC systems (for example time scheduling, and temperature settings), notification on maintenance requirements and system diagnostics.

These initiatives will provide significant savings in energy use.

3.5 WATER CONESRVATION

The following initiatives are proposed to ensure that significant water saving is achieved.

3.5.1 FITTING AND FIXTURES

Water consumption shall be reduced by incorporating water-efficient fixtures and fittings in accordance with the Australian Government's Water Efficiency Labelling Scheme (WELS). The fixtures and fittings are to have the following minimum WELS Rating. In addition, flow restrictors or taps with timed flows can be used to minimise water usage.

Water Fittings/ Fixtures	Minimum WELS Rating	Highest Available Rating (AS/NSZ 6400-2016)
Showerhead Rating	3 (>4.5, but <6L/min)	4
Toilet and Urinal Rating	4	6
Taps and Flow Controllers	6	6
Dishwashers	5	6
Washing Machines (if any)	4.5	6

3.5.2 ROOF WATER HARVESTING AND TANK STORAGE

Rainwater harvesting involves the collection, storage and distribution of rainwater from the roof, for use inside and outside of a development. It can help reduce water consumption and store and improve sustainability.

Rainwater tanks will be installed on the site to reduce the demand on potable water supplies, and will be connected to locally identified end use. The current proposal is inclusive of a Rainwater harvesting tank following the principle 10L/m² of GFA. Tank sizing will be dependent on available collection area, rainfall and demands for rainwater. The tank size will also be subject to civil & hydraulic requirements.

Proposed end uses of potable water:

- Drinking fountains
- Hand-wash basins
- Sanitary purposes
- Pool top-up

Proposed end uses of non-potable water:

- Irrigation
- Car washing
- Laundry
- Toilet Flushing

3.6 WATER SENSTIVE URBAN DESIGN

External area design will implement best practices of water sensitive urban design, including permeable paving and a mixture of low water demand locally native and exotic species suitable for the site climate. This will allow for increased stormwater retention, decreased total suspended solids and mitigating the urban heat island effect. Appropriate species selection combined with soil conditioning and water retaining mulches will reduce amount of watering required. The carbon sequestration of the plants will also combat climate change contributions. An Integrated Water Management (IWM) Plan including Water Sensitive Urban Design (WSUD) has been completed by the stormwater consultant.

PV-04

Concrete TRIHEX
permeable paving setts

NATURAL

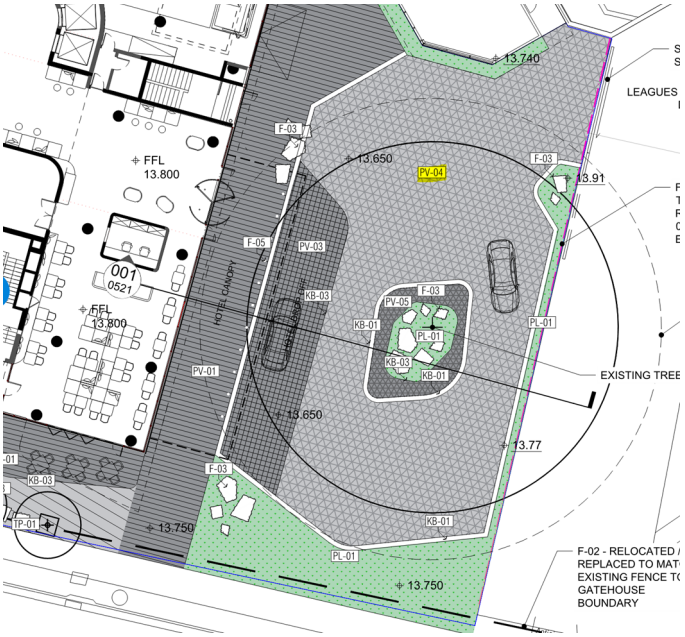


Figure 8 (Left) – Proposed Permeable Paving (Hassell, Design Report)
Figure 9 (Right)– Permeable Paving Location on Ground Floor Landscape Plan Extract (Hassell, Design Report)

3.7 INDOOR AIR QUALITY

The quality of indoor air has a significant impact on our health and environment. Poor indoor air quality resulting in adverse health effects such as allergy, asthma, etc. The outdoor air ventilation rates shall be in accordance with AS1668.2 for mechanically ventilated spaces. The ventilation system shall be designed to minimise the entry of outdoor pollutant as per ASHRAE Standard 62.1:2013.

3.8 SUSTAINABLE MATERIALS

The following initiatives are proposed to ensure that resources are being sourced in a sustainable manner and not at the expense of it future occupants or to the environment.

3.8.1 LOW VOC / LOW FORMALDEHYDE MATERIALS

Adhesives, sealants, flooring and paint products selected to contain low or no Volatile Organic Compounds (VOCs) and all engineered timber products used in exposed or concealed applications are specified to contain low or no formaldehyde to avoid harmful emissions that can cause illness and discomfort for occupants.

3.8.2 SUSTAINABLE PRODUCTS

A proportion of all materials used in the project will meet the transparency and sustainability requirements under one of the following initiatives:

- Reused Product;
- Recycled Content Products;
- Environmental Product Declarations;
- Third Party Certifications; or
- Stewardship Programs.

A rate of at least 3% of Project Sustainability Value (PSV) over Project Contract Value (PCV) targeted, subject to project monitoring and calculation using Green Star Sustainable Products Calculator.

3.8.3 RECYCLED CONTENT

Loose furnishings within the building shall be selected based on their recycled content, end-of-life recyclability and product stewardship agreements. By selecting loose furnishings which comply with independent environmental certification, for example, Ecospecifier or Good Environmental Choice Australia, the project will confidently reduce environmental impacts and waste from furnishings over the life of the building.

Steel and concrete to comply with Green Star requirements, pending feasibility.

- For steel frame buildings at least 60% of the fabricated structural steelwork shall be supplied by a steel fabricator/contractor accredited to the Environmental Sustainability Charter of the Australia Steel Institute (ASI); &
- For concrete framed buildings at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture.

3.9 ELECTRICAL ESD STRATEGIES

The following initiatives are proposed to ensure that a significant amount of energy can be saved when implemented or otherwise reduce the reliance on energy from the grid to facilitate the building's operation.

3.9.1 LIGHTING AND CONTROLS

Lighting accounts for a significant amount of energy usage in a building. Good practice lighting design generally includes energy efficient florescent and LED lighting. LED lighting is becoming a popular cost effective choice of light fitting in building design as it offers a reduction in energy consumption and operational costs.

Lighting designed to comply with or exceed the minimum requirements of NCC 2019 Section J6.

The use of occupancy sensors, daylight sensing time and zone control are to be incorporated throughout the development. Lighting in each area shall be provided with a daylight sensor to reduce light output or turn off lights when sufficient daylight is provided within the space. For larger spaces, perimeter lightings shall be designated on a separate zone to make maximum use of the daylight. Voltage control (dimming) should be provided where appropriate.

3.9.2 ELECTRICITY METERING

Electricity metering and sub-metering shall be specified in accordance with Section J and NABERS requirements to monitor and manage electricity consumption in the building.

3.9.3 ENERGY MANAGEMENT SYSTEMS

Building Management system (BMS)

BMS system is a real time control system for HVAC, DHW, lighting and small power. BMS can be used to improve indoor environment quality, optimise HVAC equipment and in reducing energy consumption throughout a building. In recent years, the cost of installing real time consumption monitoring has decreased and the user interface has improved as the industry matures. In addition to main utilities being metered, benefits can be seen by metering major energy equipment (air conditioning, lighting, hot water etc.). Monitoring allows spikes in energy use to be identified quickly and rectified if required.

Energy Consumption Display

To promote sustainability and raise awareness around energy consumption, real time energy consumption from the MBC could be displayed in the reception. It could show real-time consumption for Water, HVAC, Lighting, Solar PV and Rain Water usage levels. To display this information would have little additional cost to BMS system. It may prove to be a good marketing incentive.

Figure 10 – Example of Energy Consumption Display Interface

3.10 WASTE

Waste collection and disposal plays an important role in the protection of the environment and the health of the population in the modern world. A waste management plan has been prepared to assess and monitor the waste management process during construction and demolition, as well as waste produced during occupation within the development. The waste management plan shall incorporate how to minimise the amount of waste generated, maximise the reuse, recycling and reprocessing construction waste materials and minimise the volume to materials disposed to landfill.

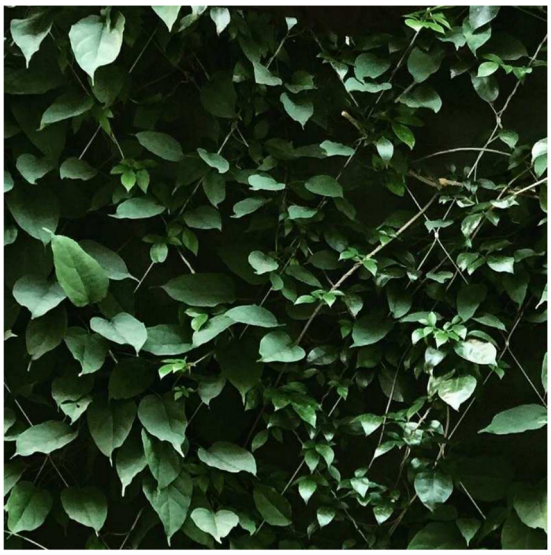
3.11 ADDITIONAL GENERAL ESD STRATEGIES

3.11.1 GREEN WALLS

As urban development strives in cities and green areas are reduced, the urban environment has caused the urban heat island effect. Research has found that metropolitan areas are considerable warmer than that of rural areas. This increase in temperature causes a negative impact on the environment through the increasing energy demands in summer to air pollutants and emissions.

Green Walls are to be implemented on this project located on East & West facades accompanying the hotel occupant's rooms. Aside from the aesthetic value they add to the development and the biophilic experience to the occupants, these green walls also function to offset the solar gains than if it were conventionally brick or concrete finish.

By having vegetation on the exterior walls in close proximity with occupants, they are able to provide improved air quality and a degree of insulation to the building envelope through the evapotranspiration of the plants.



GRN-01
SS wall mounted trellis system with planting and integrated irrigation
--

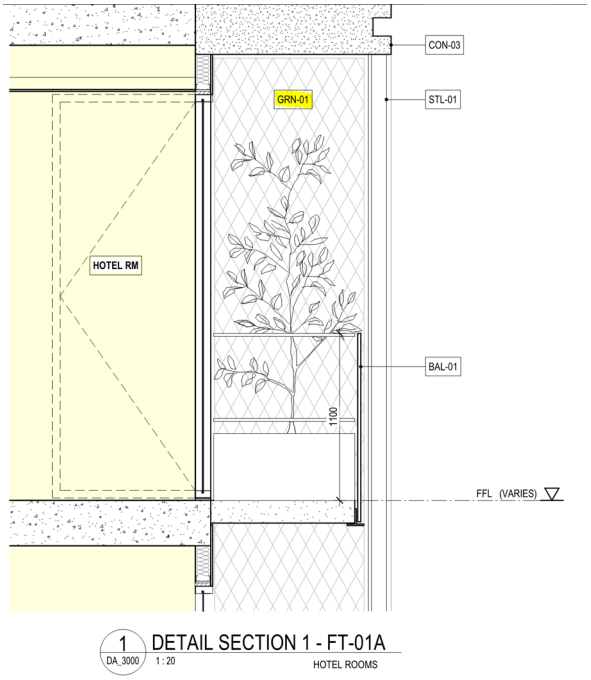


Figure 11 (Left) – Proposed Green Wall System (Hassell, Design Report)
Figure 12 (Right)– Detail Section of Hotel Room Façade Type 01A and Location of Green Wall (Hassell, Design Report)

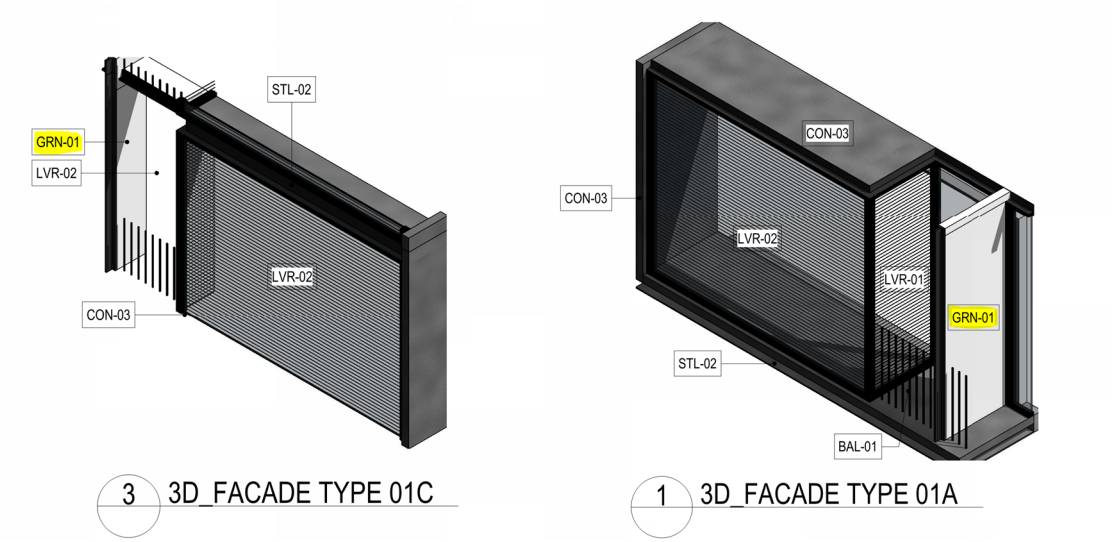


Figure 13 (Left) – Green Wall Location for Façade Type 01C for Hotel Rooms (Hassell, Design Report)
Figure 14 (Right)– Green Wall Location for Façade Type 01A for Hotel Rooms (Hassell, Design Report)

The green walls are to be mounted on the walls adjacent to hotel occupant's rooms using a trellis system with irrigation provided for the vegetation. Different façade types have been taken into account to accommodate rooms on different levels. Façade Type 01A makes up the majority of the hotel rooms whilst Façade Type 01C is implemented for levels closer to the ground and roof. The extracts below highlight where these façade types (and corresponding green walls) are to be implemented in the development.

Figure 15 (Above)– Extract of Building Envelope from Northern Access Rd for Façade type location (Hassell, Design Report)

Figure 16 (Above) - Extract of Building Envelope from O'Connell Street for Façade type location(Hassell, Design Report)

3.11.2 GREEN ROOFS

Similarly to Green Walls, green roofs are able to provide the same benefits with the main difference being the infrastructure required to support it. The proposed green roof is to be implemented on Level 4 of the hotel making up the garden terrace with the function rooms below.

With the location of this green roof and the how it extends across the terrace deck, its ability to mitigate urban heat island effect is increased. Having vegetation act as shade to cover heavy building materials allows for surface temperature of the roof to reduce, this in turn can reduce HVAC loads.

Another benefit is that green roofs can provide a habitat at roof level, especially in urban areas and can have significant benefits for flora, fauna and wildlife, notably invertebrates and birds.

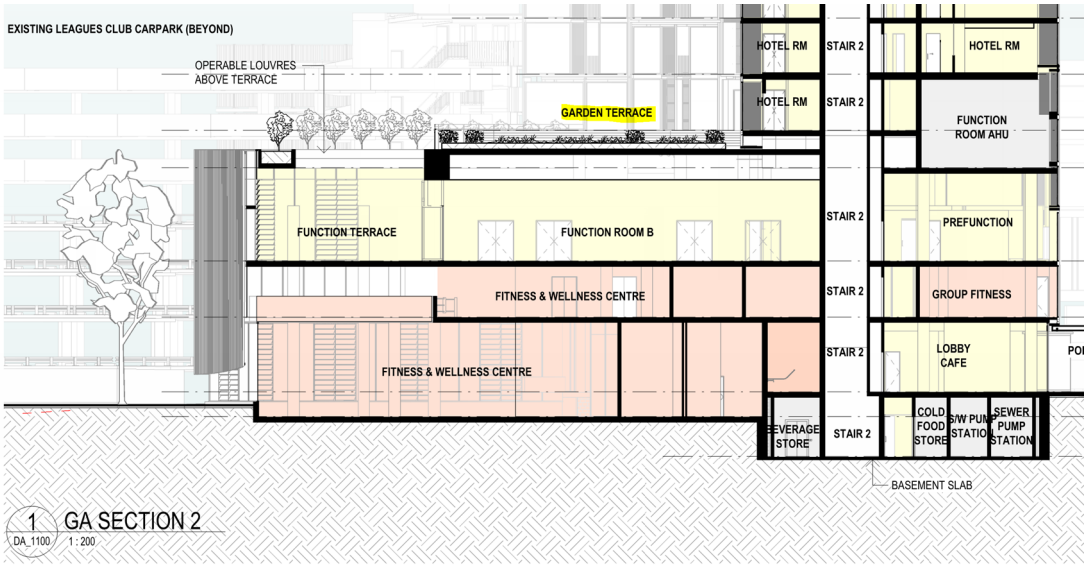


Figure 17 (Above) - Extract of GA Elevation- Green Roof Location Highlighted (Hassell, Design Report)

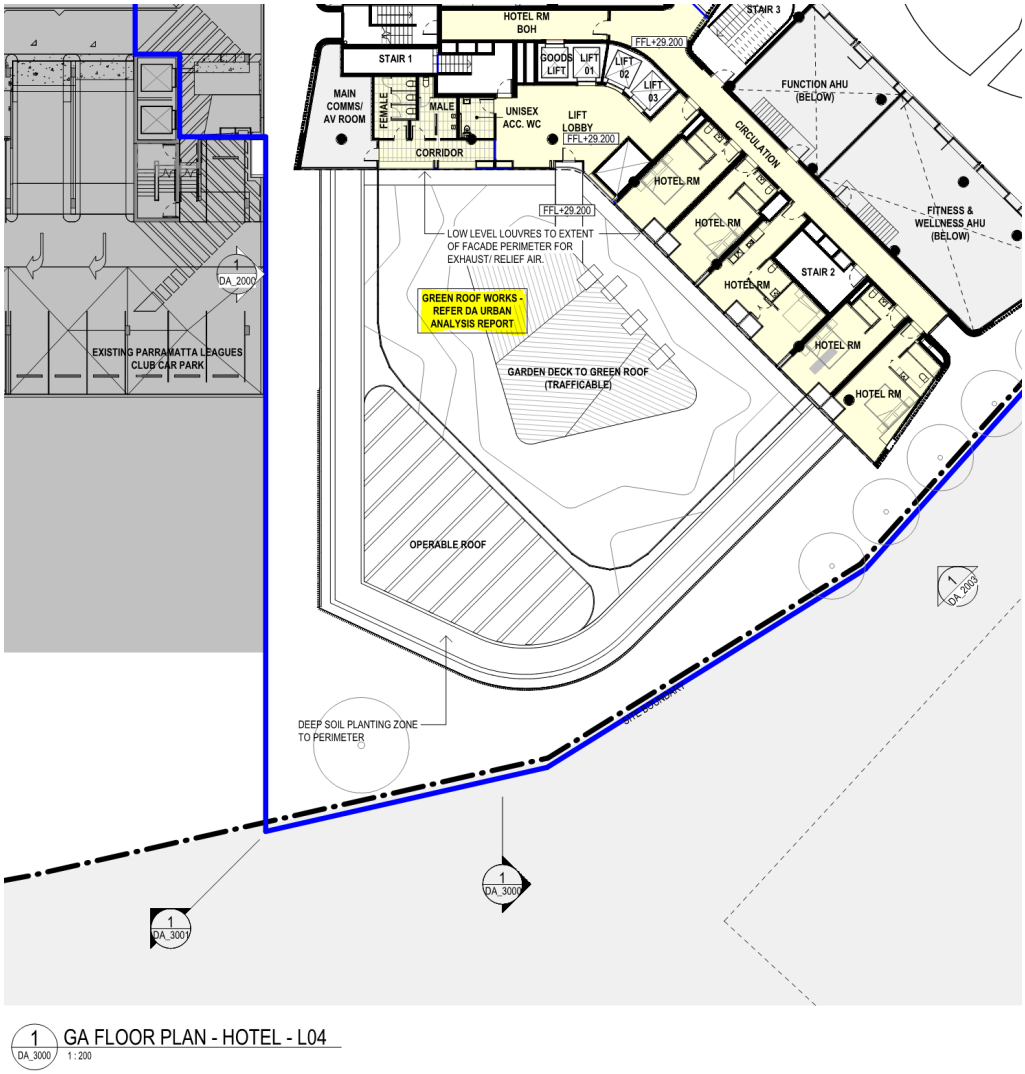


Figure 18 (Above) - Extract of GA Floor Plan Level 4 - Garden Terrace with Green Roof Location (Hassell, Design Report)

4 GREEN STAR RATING SCHEME COMPARISON

This project is not pursuing a formal Green Star rating through the certification procedures of the Green Building Council Australia (GBCA). However, the project team has benchmarked it against the Green Star Design and As Built v1.3 (or applicable equivalent) Rating System, with a goal of a five (5) Star Green Star equivalency.

For the purposes of comparison, the following table has been prepared which outlines the sustainability initiatives which have been considered for this project and are recognised by the Green Star Rating Tool.

An ESD Design workshop will be held early in the design stage, led by the ESD consultant and include the project architect, building services engineering consultants, civil engineer, and structural engineer among others.

Credit	Points Available	Targeted Points	Responsibility
Management			
Green Star Accredited Professional	1	1	ESD
Commissioning and Tuning	4	3	All service consultants
Adaptation and Resilience	2	2	All service consultants
Building Information	1	1	Head Contractor
Commitment to Performance	2	2	Owner, Architect
Metering and Monitoring	1	1	Mechanical, Electrical & Hydraulic Services
Responsible Construction Practices	2	2	Head Contractor
Operational Waste	1	1	Architect
Indoor Environmental Quality			
Indoor Air Quality	4	1	Mechanical
Acoustic Comfort	3	3	Acoustic
Lighting Comfort	3	2	Electrical & Architect & ESD
Visual Comfort	3	3	Architect & ESD
Indoor Pollutants	2	2	Architect & Services Consultants
Thermal Comfort	2	1	Mechanical & ESD
Energy			
Greenhouse Gas Emissions	20	7	ESD, Service Consultant & Architects
Peak Electricity Demand Reduction	2	1	Architect, Electric, Owner
Transport			
Sustainable Transport	10	4	Traffic Consultant, Owner & Architect
Water			
Portable Water	12	6	Architect, Hydraulic
Materials			

Life Cycle Impacts	7	4	ESD, Architect, Head Contractor & Structural
Responsible Building Materials	3	3	Head Contractor
Sustainable Products	3	2	Architect, Owner
Construction and Demolition Waste	1	1	Head Contractor
Land Use & Ecology			
Ecological Value	3	0	Landscape
Sustainable Sites	2	1	Owner
Heat Island Effect	1	0	
Emissions			
Stormwater	2	2	Civil & Hydraulics
Light Pollution	1	1	Electrical
Microbial Control	1	1	Mechanical
Refrigerant Impacts	1	1	Mechanical
Innovation			
Innovation	10	2	Architect, Owner, Project Manager

The above exercise resulted in the required 61 weighted points for the five (5) Star equivalency.

Weighting is calculated as per the official Green Star Design and As Built v1.3 Scorecard.

5 CONCLUSION

The following table summarises the ESD strategies proposed for this development, they are to be agreed upon by all parties following further discussion. ESD measures have also been recommended for conversation and to question their feasibility for implementation.

Proposed ESD Measures
▪ Appropriate Building Envelope Construction and Glazing Selection ▪ External Vertical shading devices and Interstitial Timber Louvres for Hotel Rooms ▪ Natural Ventilation via Operable Glazing Louvres for Hotel Rooms ▪ Energy-efficient air-conditioning systems with control strategy and thermal comfort tuning ▪ Efficient lighting systems with appropriate timing-controls ▪ High WELS rated water fixtures ▪ Sustainable materials ▪ Green Walls & Green Roofs ▪ Permeable Paving & Plantation of Native Species ▪ Electric Metering ▪ BMS & Energy Monitoring System Implemented
Recommended ESD Measures
▪ Inclusion of renewable alternative energy sources i.e Solar PV Panels System ▪ Solar PV system combined with battery storage ▪ Roof Water Harvesting & Tank Storage ▪ Solar Thermal Hot Water System