18 Mason Street Warragul

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Issue	Date	Prepared	Checked	Status
A	01.05.2023	FP/LT/MT	MR	Draft
B	04.05.2023	FP/LT/MT	MR	Draft
C	05.05.2023	FP/LT/MT	MR	For Consultation

Contents

Appendices

1.0 Introduction

Ark Resources has been engaged by Housing Choices Australia Limited to provide advice in relation to environmentally sustainable development outcomes from the proposed development at 18 Mason Street, Warragul.

The proposed mixed-use development at 18 Mason Street, Warragul has been designed to meet Baw Baw Planning Scheme Clauses 15.01-2S and 19-03-3S.

This report contains a summary of:

- Environmental objectives adopted for the development.
- Sustainable design initiatives integrated into the design of the project.

Performance outcomes in this report are based on:

- Discussions and correspondence with
    - Housing Choice Australia
    - Freadman White Architects

Architectural drawings prepared by Freadman White Architects set out below.

SUMMARY	TP.0.1	TP1	11/04/2023
LOCATION PLAN	TP.0.2	TP1	11/04/2023
SURVEY PLAN	TP.0.3	TP1	11/04/2023
SITE PLAN	TP.0.4	TP1	11/04/2023
BASEMENT PLAN @ 1:200	TP.2.1	TP1	11/04/2023
BASEMENT PLAN	TP.2.2	TP1	11/04/2023
GROUND FLOOR PLAN @ 1:200	TP.2.3	TP1	11/04/2023
GROUND FLOOR PLAN	TP.2.4	TP1	11/04/2023
LEVEL 01 FLOOR PLAN	TP.2.5	TP1	11/04/2023
LEVEL 02-03 FLOOR PLAN	TP.2.6	TP1	11/04/2023
ROOF PLAN	TP.2.7	TP1	11/04/2023
EXISTING STREET ELEVATION	TP.3.1	TP1	11/04/2023
PROPOSED STREET ELEVATION	TP.3.2	TP1	11/04/2023
SECTION A & B	TP.4.1	TP1	11/04/2023
SECTION C	TP.4.2	TP1	11/04/2023
SECTION D	TP.4.3	TP1	11/04/2023
SECTION E	TP.4.4	TP1	11/04/2023
OVERSHADOWING - 9AM (21 SEPT)	TP.5.1	TP1	11/04/2023
OVERSHADOWING - 10AM (21 SEPT)	TP.5.2	TP1	11/04/2023
OVERSHADOWING - 11AM (21 SEPT)	TP.5.3	TP1	11/04/2023
OVERSHADOWING - 12PM (21 SEPT)	TP.5.4	TP1	11/04/2023
OVERSHADOWING - 1PM (21 SEPT)	TP.5.5	TP1	11/04/2023
OVERSHADOWING - 2PM (21 SEPT)	TP.5.6	TP1	11/04/2023
OVERSHADOWING - 3PM (21 SEPT)	TP.5.7	TP1	11/04/2023
COS OVERSHADOWING - 11AM (21 JUNE)	TP.5.8	TP1	11/04/2023
COS OVERSHADOWING - 12PM (21 JUNE)	TP.5.9	TP1	11/04/2023
COS OVERSHADOWING - 1PM (21 JUNE)	TP.5.10	TP1	11/04/2023
BADS PLAN	TP.6.1	TP1	11/04/2023
TYPICAL APARTMENT PLANS 1:100	TP.7.1	TP1	11/04/2023

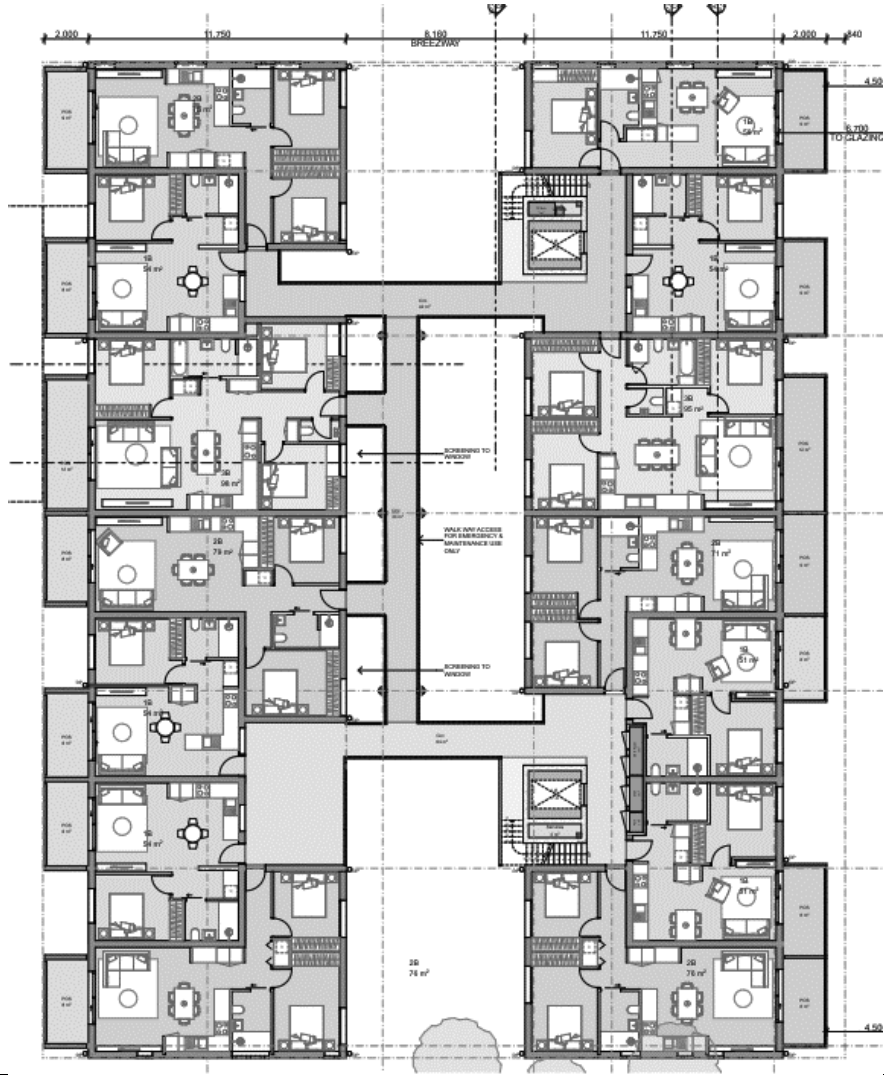
2.0 Site Description

The building comprises the following uses:

- Community/Office space with a total NLA of approximately 209m^2; and
- 51 apartments/84 bedrooms (approximately 135 occupants).
- Located within the Baw Baw Council
- Site area 1661m2 (approximately)
- Surrounds mix of residential and commercial uses.

A plan of the proposed development is provided below.

An image of the site and the surrounding locale is provided on the following page.




Smith St
Williams St
18 Mason St
Gladstone St
Gladstone St
Princes Way
Princes Way
C425

3.0 Key ESD Initiatives

A detailed analysis has been undertaken in order to nominate the ESD initiatives required and confirm the performance outcomes achieved. The results of this analysis are set out in the remainder of this report.

The following key sustainable design initiatives have been incorporated into this project:

- Rainwater harvesting system for toilet flushing and irrigation;
- Achieve sustainable water cycle management through:
  - Efficient use of potable water supplies
  - Recycling and re-use of alternative water sources
  - Integration of stormwater treatment into the design of urban spaces and landscapes
- Rooftop photovoltaic systems with a peak capacity of 64kW.
- High-performance glazing and energy efficient building services, appliances and fixtures;
- Environmentally preferable internal finishes;
- Provide landscaping which enhances amenity and contributes to biodiversity; and
- Encourage walking and cycling to reduce the extent of private car use.

An assessment of sustainable design outcomes of the proposed development has been undertaken with Green Star Buildings and MUSIC benchmarking tools. The information presented in this report demonstrates that:

Green Star Buildings The development achieves a 4 Star Green Star Buildings performance standard 4.0 star	**NatHERS Energy Ratings** The development will achieve a development average of 7.0 star
Daylight The development will meet the BESS daylight standard 	**Stormwater** The development meets the Best Practice standard for stormwater quality. 

4.0 MUSIC Modelling

To assess the quality of stormwater runoff from the site, an analysis has been undertaken using MUSIC Modelling software.

The proposed development exceeds the pollutant load reduction targets set out in the Best Practice Environmental Management Guidelines (BPEMG)

Reduction in Total Suspended Solids (TSS) load: **93.5%**	Reduction in Total Phosphorus (TP) load: **83.1%**
Reduction in Total Nitrogen (TN) load: **75.9%**	Reduction in Gross Pollutants (GP) load: **100%**

The results indicate that the project meets the requirements of Planning Scheme as the post development stormwater peak discharge does not exceed the pre-development peak.

Refer to Appendix B.1 for the MUSIC rating results, Appendix B.2 for rainwater harvesting and reliability results and Appendix D for the WSUD Maintenance Manual.

A rainwater harvesting system will be installed comprising:

- Rainwater harvesting from all roofs and terrace areas (approx. 1,168m^2):
- Filtration and treatment of all rainwater prior to draining into the tank
- Total storage volume of 40kL rainwater tanks
- Re-use of captured water for flushing of all toilets
- 25m^2 of pervious area equating to 1% of the site area

In addition to the harvesting and re-use of rainwater, the following features will be incorporated into the proposed design to facilitate treatment of stormwater runoff:

- Raingardens to treat podium paved areas.
- A SPEL Stormfilter gross pollutant trap (or equivalent primary treatment device) located near stormwater Legal Point of Discharge to capture suspended solids and litter generated onsite.

5.0 Preliminary JV3 Simulation

Preliminary energy modelling has been undertaken to demonstrate compliance of the new works to the proposed redevelopment with Section J0 (Energy Efficiency) and Section J1 (Building Fabric) of the NCC 2019 (Volume One).

The results of the JV3 analysis demonstrates that the proposed design achieves compliance with Part J1 Building Fabric of NCC 2019, based on the design and modelling assumptions set out in this report.

Refer to Appendix H for JV3 details and assumptions.

Building Fabric Improvement over NCC

2.8%

Reference Total Greenhouse Gas Emissions (KgCO2-e/year)

4,658

Proposed Total Greenhouse Gas Emissions (KgCO2-e/year)

4,529

6.0 NatHERS Energy Ratings

FirstRate5 Version 5.3.2b (3.21) energy ratings have been undertaken for a representative sample of the apartments.

The development achieves a 7.0 star average NatHERS rating which exceeds the Councils 'best practice' standard of 6.5 stars and represents a high standard of thermal efficiency.

Please refer to Appendix B for details of energy ratings and building construction assumptions.

NatHERS Rating The development average NatHERS rating will be: 7.0star	
Average Heating Load 82.8 MJ/m²	Average Cooling Load 13.7 MJ/m²

The results of the modelling confirm that:

- The development achieves a 7 star average NatHERS rating which exceeds the Councils 'best practice' standard of 6.5 stars and represents a high standard of thermal efficiency;
- All individual apartments have cooling loads of less than 22 MJ/m² and therefore meet the energy efficiency objectives set out in clause 58.03-1 of the Planning Scheme for the relevant climate zone (NatHERS Climate Zone 22 East Sale);
- The average heating load of 82.8 MJ/m² and the cooling load of 13.7 MJ/m² are significantly less than the relevant threshold loads set out in NCC 2019 for Class 2 dwellings (average heating load <118 MJ/m², average cooling load <23 MJ/m²), and;
- The individual apartment heating and cooling loads are significantly less than the relevant threshold loads set out in NCC 2019 for Class 2 dwellings (heating load <157 MJ/m², cooling load <40 MJ/m²).

Apartment	Star Rating	Energy Demand (MJ/m²)		
		Total	Heating	Cooling
G.01	7.7	73.9	57.1	16.8
G.02	6.6	110.6	99.0	11.6
G.03	6.9	100.9	97.3	3.6
G.04	6.7	109.6	105.1	4.5
G.05	6.9	100.2	79.3	20.9
G.07	6.2	126.5	120.2	6.3
G.08	6.0	131.8	129.3	2.5
G.09	5.8	140.3	136.8	3.5
1.01	8.0	62.8	41.4	21.4
1.02	7.5	79.9	68.3	11.6
1.05	8.1	59.7	46.0	13.7
1.08	6.9	99.3	91.7	7.6
1.10	7.4	84.4	69.2	15.2
1.11	7.7	74.2	69.0	5.2
1.12	7.6	76.4	68.5	7.9
1.13	7.8	69.4	55.7	13.7
1.14	8.0	61.7	40.9	20.8
3.01	7.2	7.2	91.5	70.5
3.02	6.5	6.5	113.6	95.3
3.03	7.0	7.1	92.9	81.9
3.04	6.9	7.0	97.3	84.6
3.05	6.9	6.9	102.0	80.5
3.07	6.3	6.4	119.9	105.2
3.08	6.4	6.4	116.6	96.4
3.10	6.6	6.5	113.9	93.2
3.11	6.9	7.0	96.5	81.7
3.12	7.1	7.2	92.1	76.4
3.13	6.9	6.8	103.2	83.8
3.14	7.0	6.9	98.3	76.7
Estimated Development Average	**7.0**	**96.5**	**82.8**	**13.7**

The energy ratings set out above indicate that the development will exceed the standard required by the National Construction Code 2019 in relation to residential sustainability.

Please refer to Appendix B for details of energy ratings and building construction assumptions.

7.0 Green Star Building

The Green Star Buildings (v1 Rev B) tool has been used as a benchmarking framework for the proposed scheme and demonstrates that the development has the preliminary design potential to achieve a 4 Star standard.

A detailed Green Star assessment has been undertaken to confirm the credits achievable by the proposed scheme.

The initiatives which contribute to the 4 Star Green Star Buildings rating are detailed in Section 8.1 below.

Please note that this analysis is based on the best information currently available in relation to the technical and commercial feasibility of the initiatives proposed. Further investigation will be undertaken during design development which may result in change to the package of initiatives specified in order to meet the 4 Star Green Star standard.

Green Star Building Rating

4 star

Total Points Targeted

32 pts

Note that a minimum of 15 points must be achieved for a 4 star Green Star Buildings rating to be achieved. The development will attain a 4 star Green Star rating certified with the Green Building Council. A 17 point margin has been incorporated into the pathway presented in this report as a contingency to allow for the inevitable change to the pathway inclusive of attrition which typically occurs during the detailed design and construction phases. This does not imply that the applicant commits to delivering more than the points required for the rating targeted.

Summary of Green Star Building credits targeted.

Credit		Target	Points
1	Industry Development	Credit Achievement	1
2	Responsible Construction	Credit Achievement	1
3	Verification and Handover	Minimum Expectation	
4	Operational Waste	Minimum Expectation	
9	Responsible Finishes	Credit Achievement	1
10	Clean Air	Minimum Expectation	
11	Light Quality	Minimum Expectation	
12	Acoustic Comfort	Minimum Expectation	
13	Exposure to Toxins	Credit Achievement	2
15	Connection to Nature	Credit Achievement	1
16	Climate Change Resilience	Credit Achievement	1
17	Operations Resilience	Credit Achievement	2
19	Heat Resilience	Credit Achievement	1
21	Upfront Carbon Emissions	Minimum Expectation	
22	Energy Use	Credit Achievement	3
23	Energy Source	Exceptional Performance	6
25	Water Use	Minimum Expectation	
27	Movement and Place	Credit Achievement	3
29	Contribution to Place	Credit Achievement	2
30	Culture, Heritage and Identity	Credit Achievement	1
31	Inclusive Construction Practices	Credit Achievement	1
32	Indigenous Inclusion	Credit Achievement	2
34	Design for Inclusion	Credit Achievement	2
35	Impacts to Nature	Minimum Expectation	
39	Waterway Protection	Credit Achievement	2

Refer to Appendix A for details of credit requirements.

Please note that this analysis is based on the best information currently available in relation to the technical and commercial feasibility of the initiatives proposed. Further investigation will be undertaken during design development which may result in change to the package of initiatives specified in order to meet the 4 star Green Star Buildings.

8.0 Conclusion

This report provides details of a comprehensive package of sustainable design features which will be integrated into the design and specification of the proposed mixed-use development in order to improve environmental outcomes during occupation.

In terms of performance outcomes, the analysis presented in this report demonstrates that the proposed development will:

- Attain a 4 star Green Star standard based on the Buildings rating tool (V1 Rev B);
- Achieve a 7.0 average star rating for the apartments;
- Meet the BESS standard for internal daylight; and
- Attain the Best Practice standard for urban stormwater quality

Accordingly, the sustainable design outcomes from the proposed development are considered to be consistent with the objectives of Clauses 15.02-1S (Energy and Resource Efficiency) and 22.01 (Stormwater Management Policy) of the Baw Baw Planning Scheme.

Green Star

The combination of design features and services initiatives meets all the standards for a Green Star Building Rating of:

4 star

NatHERS Energy Rating

The development will achieve an average NatHERS rating of:

7.0star

Best Practice

The development meets the Best Practice standard for stormwater Quality

Appendix A. Green Star Building Pathway

The key design elements and processes which underpin the preliminary Green Star rating are summarised in the table below. The design attributes will be incorporated into the design in accordance with the technical criteria for each credit set out in the Green Star Buildings Technical Manual (v1 Revision B, 10 December 2021).

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
1 Industry Development The development facilitates industry transformation through partnership, collaboration, and data sharing	The building owner or developer appoints a Green Star Accredited Professional (GSAP).	1	Strategy Brief Concept Design Tender Construction Handover Use
	The building owner or developer discloses the cost of sustainable building practices to the GBCA. The project team must complete, and include in the submission, the Green Star Financial Transparency disclosure template. The template requires and enables the project team to submit the cost of sustainable building practices of the project including design, construction, and documentation to the GBCA.		
	The building owner or developer markets the building's sustainability achievements. The project team must: – Provide information from the project's marketing team must answer the questions in the submission form for a Green Star Case Study. The case study seeks information on the sustainability initiatives that the building targeted to enable it being featured on the GBCA's website – Detail how the building will detail its sustainability achievements to its stakeholders. The stakeholders are defined as the typical building occupants and visitors.		
	The building owner or developer appoints a Green Star Accredited Professional (GSAP).		
2 Responsible Construction The builder's construction practices reduce impacts and promote opportunities for improved environmental and social outcomes	The builder must have an environmental management system (large builders will need to be ISO14001 accredited).	MINIMUM EXPECTATION	Tender Construction
	The site must have a project specific Environmental Management Plan (EMP). The EMP must be developed to cover the scope of construction activities to assist the head contractor and its service providers to manage environmental performance conditions and impacts arising from demolition, excavation, and construction. It must be implemented from the start of construction and include all works within the project scope.		
	80% of Construction and demolition waste must be recycled.		
	The builder must have an environmental management system (large builders will need to be ISO14001 accredited).		
	Sustainability training is provided to construction workers.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	The head contractor must provide the following training: – Information on the sustainable building certification(s) sought, including: · the sustainability attributes of the building and their benefits the value of certification · the role site worker(s) play in delivering a sustainable building		
	90% of construction and demolition waste is diverted from landfill, and waste contractors and facilities comply with the Green Star Construction and Demolition Waste Reporting Criteria	1	
3 Verification and Handover The building has been optimised and handed over to deliver a high level of performance in operation	The building is set up for optimum ongoing management due to its appropriate metering and monitoring systems. The building must have accessible energy and water metering for all common uses, major uses, and major sources. The meters must be connected to a monitoring system capable of capturing and processing the data produced by the meters. The monitoring system must accurately and clearly present the metered data and include reports on consumption trends for the automatic monitoring system.	MINIMUM EXPECTATION	Design Tender Construction Handover Use
	The building has set environmental performance targets, designed and tested for airtightness, been commissioned, and will be tuned. The project team must perform the following: – Prior to construction: · Set environmental performance targets · Perform a services and maintainability review · Design for airtightness – During construction and practical completion: · Commission the building · Engage building tuning service provider · Test for airtightness – After practical completion: · Tune the building over the next 12 months		
	The project team create and deliver operations and maintenance information to the facilities management team at the time of handover. Information is available to building users on how to best use the building.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	The project team must provide operations and maintenance information for all nominated building systems to the building owner (or designated representative). This means: – Appropriate content for all nominated building systems has been developed and provided – The appropriate user group has access to the information they require to deliver best practice environmental outcomes – Guidance on keeping information up to date is provided to the facilities management team in these documents		
4 Operational Waste Operational waste can be separated and recovered in a safe and efficient manner The building must have appropriate spaces for waste management and an appropriately sized loading dock	The building is designed for the collection of separate waste streams. The building must provide bins or storage containers to building occupants to enable them to separate their waste. These bins must be labelled and easy to access, and evenly distributed throughout the building. They must also allow for separating the following as a minimum: – General waste going to landfill – Recycling streams to be collected by the building's waste collection service, including: · paper and cardboard · glass · plastic – One additional waste stream identified by the project team. This may include collecting any of the following waste types: · organics, e-waste, batteries etc.	MINIMUM EXPECTATION	Design Handover Use
	The building provides a dedicated and adequately sized waste storage area. A dedicated area, or areas, for the storage and collection of the applicable waste streams must be provided. The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle.		
	The building ensures safe and efficient access to waste storage areas for both occupants and waste collection contractors. A waste specialist and/or contractor must sign-off on the designs to confirm they are adequately sized and located for the safe and convenient storage and collection of the waste streams identified.		
9 Responsible Finishes	40% of all internal building finishes (by cost) meet a Responsible Products Value of at least 7.	1	Design Tender Construction

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
The building's internal finishes are comprised of responsibly manufactured products	Internal finishes include flooring, plasterboard, paints, ceilings, partitions, doors, internal windows or similar. Joinery used as part of a wall finish may be counted, e.g. wall panelling or fixed shelving/cupboards that make up a partition. Sealants and adhesives used for finishes are also included. Loose furniture is not included.		
10 Clean Air Pollutants entering the building are minimised, and a high level of fresh air is provided to ensure levels of indoor pollutants are maintained at acceptable levels	Non-residential building ventilation systems must be designed to comply with ASHRAE Standard 62.1:2013 or AS 1668:2012 (whichever is greater) regarding minimum separation distances between pollution sources and outdoor air intakes. All new and existing ductwork that serves the building must be cleaned prior to occupation in accordance with a recognised Standard.	MINIMUM EXPECTATION	Design Tender Construction Handover Use
	The building must be provided with at an adequate amount of outside air. The regularly occupied areas must be provided with good access to outdoor air, appropriate for the activities and conditions by using one of the following options: Where ventilation is by mechanical means, the building must provide outdoor air as per AS1668.2:2012 for the default occupancy. Where ventilation is by natural means, the building must meet natural ventilation requirements as per AS1668.4:2012. Where active heating or cooling is provided, a dedicated and controlled outside air path must be constructed and commissioned at a rate of at least 2.5L/s per bedroom and living space, with a minimum of 5L/s per unit. Outside air must be provided to each space that is heated or cooled.		
	Point source pollutants must be exhausted directly outside (printers, kitchens).		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
11 Light Quality The building provides good daylight and its lighting is of high quality	Lighting within the building meets minimum comfort requirements. Lighting within the building must meet the following requirements: – All LED lighting installed has no observable effect as per the standard IEEE 1789-2015 – Light sources must have a minimum Colour Rendering Index (CRI) 85 or higher – Light sources must meet best practice illuminance levels for each task within each space type with a maintained illuminance that meets the levels recommended in AS/NZS 1680.1:2006 – The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS/NZS 1680.1:2006, with a maintenance factor method as defined in AS/NZS 1680.4 – All light sources must have a maximum of 3 MacAdam Ellipses deviation.	MINIMUM EXPECTATION	Concept Design Tender
	Good lighting levels suitable for the typical tasks in each space are available.		
	The building provides adequate levels of daylight. – Ensures regularly occupied areas are in reasonable proximity to glazed façades, windows, or skylights – Maximises daylight to spaces that prioritise learning, healing, and living: · For apartments, how in 95% of all apartments, the living rooms and all bedrooms have access to a view and daylight.		
12 Acoustic Comfort The building provides acoustic comfort for building occupants	Internal noise levels from services and the outside is limited through an acoustic comfort strategy. The Acoustic Comfort Strategy is to include: – A summary of the Standards, legislation, guidelines, and other requirements that apply to the project – The proposed performance metrics for each of the Acoustic Comfort criteria relevant to the different uses within the building and whether this exceeds minimum legislative or best practice guidelines – Description of how the design solution is intended to achieve the proposed performance metrics	MINIMUM EXPECTATION	Design Tender Construction Handover

<table>
<tr><th>Green Star Credit Project Outcomes</th><th>Credit outcomes</th><th>Target</th><th>Project Stage</th></tr>
<tr><td rowspan="2">13 Exposure to Toxins

The building's occupants are not directly exposed to toxins in the spaces they spend time in</td><td>The building's paints adhesives, sealants, and carpets are low in TVOC or non-toxic.

At least 95% of internally applied paints, adhesives, sealants (by volume) and carpets (by area) must meet stipulated 'Total Volatile Organic Compounds (TVOC) Limits' below.

Paints, Adhesives and Sealants

<table>
<tr><th>Product category</th><th>Max. Total Volatile Organic Compounds (TVOC) content in grams per litre (g/L) of ready to use product</th></tr>
<tr><td>General purpose adhesives and sealants</td><td>50</td></tr>
<tr><td>Interior wall and ceiling paint, all sheen levels</td><td>16</td></tr>
<tr><td>Trim, varnishes, and wood stains</td><td>75</td></tr>
<tr><td>Primers, sealers, and prep coats</td><td>65</td></tr>
<tr><td>One and two pack performance coatings for floors</td><td>140</td></tr>
<tr><td>Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives</td><td>250</td></tr>
<tr><td>Structural glazing adhesive, wood flooring and laminate adhesives and sealants</td><td>100</td></tr>
</table>
Carpets

<table>
<tr><th>Compliance option</th><th>Test protocol</th><th>Limit</th></tr>
<tr><td rowspan="2">ASTM D5116</td><td>ASTM D5116 - Total VOC limit*</td><td>limit* 0.5mg/m² per hour</td></tr>
<tr><td>ASTM D5116 - 4-PC (4-Phenylcyclohexene) *</td><td>0.05mg/m² per hour</td></tr>
<tr><td>ISO 16000 / EN 13419</td><td>ISO 16000 / EN 13419 - TVOC at three days</td><td>0.5 mg/m² per hour</td></tr>
<tr><td>ISO 10580 / ISO/TC 219 (Document N238)</td><td>ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours</td><td>0.5mg/m² per hour</td></tr>
</table>
</td><td rowspan="2">MINIMUM EXPECTATION</td><td rowspan="2">Design
Tender
Construction
Handover</td></tr>
<tr><td>The building's engineered wood products are low in TVOC or non-toxic.</td></tr>
</table>

<table>
<tr><th>Green Star Credit Project Outcomes</th><th>Credit outcomes</th><th>Target</th><th>Project Stage</th></tr>
<tr><td></td><td>Either no new engineered wood products are used in the building, or at least 95% (by area) of all engineered wood products meet specified formaldehyde emission limits, as per the following:
<table>
<tr><th>Test protocol</th><th>Emissions Limit / Unit of Measurement</th></tr>
<tr><td>AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood</td><td>≤1mg/L</td></tr>
<tr><td>AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16</td><td>≤1.5 mg/L</td></tr>
<tr><td>AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16</td><td>≤1mg/L</td></tr>
<tr><td>AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)</td><td>≤1mg/L</td></tr>
<tr><td>Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL</td><td>≤1mg/L</td></tr>
<tr><td>JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460</td><td>≤1mg/L</td></tr>
<tr><td>JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460</td><td>≤1mg/L</td></tr>
<tr><td>JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)</td><td>≤0.1 mg/m²hr*</td></tr>
</table>
<table>
<tr><th>Test protocol</th><th>Emissions Limit / Unit of Measurement</th></tr>
<tr><td>ASTM D5116 (applicable to high pressure laminates and compact laminates)</td><td>≤0.1 mg/m²hr</td></tr>
<tr><td>ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates</td><td>≤0.1 mg/m²hr (at 3 days)</td></tr>
<tr><td>ASTM D6007</td><td>≤0.12mg/m³**</td></tr>
<tr><td>ASTM E1333</td><td>≤0.12mg/m³***</td></tr>
<tr><td>EN 717-1 (also known as DIN EN 717-1)</td><td>≤0.12mg/m</td></tr>
<tr><td>EN 717-2 (also known as DIN EN 717-2)</td><td>≤3.5mg/m²hr</td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td>Occupants are not exposed to banned or highly toxic materials in the building.
A comprehensive hazardous materials survey must be carried out on any existing buildings or structures on the project site, in accordance with the relevant Environmental and Work Health and Safety (WHS) legislation.</td><td></td><td></td></tr>
<tr><td></td><td>On-site tests verify the building has low Volatile Organic Compounds (VOC) and formaldehyde levels as follows:
<table>
<tr><th>Element</th><th>Concentration</th></tr>
<tr><td>TVOC</td><td>0.27 ppm</td></tr>
<tr><td>Formaldehyde</td><td>0.02 ppm</td></tr>
</table></td><td>2</td><td></td></tr>
<tr><td>15 Connection to Nature</td><td>At least 60% of regularly occupied areas must have a clear line of sight to a high quality internal or external view. All floor areas within 8m from a compliant view meet this credit criterion.</td><td>1</td><td>Brief
Concept</td></tr>
</table>

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
The building fosters connection to nature for building occupants	Indoor plants must be provided in regularly occupied areas. One or more plants in pots with a soil surface area totalling at least 500cm² for every 15m² of the regularly occupied spaces is required. Project teams must provide a narrative against a set of design principles to show how the project's ambition for nature inspired design has been embedded from design concept stage. or Occupants can interact with nature either inside the building, or externally through a green façade (or wall) or garden. At least 5% of the building's regularly occupied areas or land within the site boundary (whichever is greater) must be planted area (either vertical or horizontal).		Design Tender Handover Use
16 Climate Change Resilience The building has been built to respond to the direct and indirect impacts of climate change	The project team completes the climate change pre-screening checklist. The project team communicates the building's exposure to climate change risks to the applicant	MINIMUM EXPECTATION	Strategy Brief Concept Design
17 Operations Resilience The building can respond to acute shocks and chronic stresses that can affect its operations over time	The project team undertakes a comprehensive risk assessment of the acute shocks and chronic stresses likely to influence future building operations, including: – Failure of critical infrastructure (power, water and digital) – Health pandemic – Water security – Geological hazards (landslides, earthquakes, tsunamis) – Direct attack (cyber and physical) – Ageing infrastructure – Rising cyber dependency – Increasing energy costs – Lack of transport accessibility and availability	2	Strategy Brief Concept Design
	The building's design and future operational plan addresses any high or extreme system-level interdependency risks.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	The building's design maintains a level of survivability and design purpose in a blackout. The building must then be designed to account for its design purpose and provide a measure of survivability for the likely occupants.		
19 Heat Resilience The building reduces its impact on heat island effect	At least 75% of the whole site area comprises of one or a combination of strategies that reduce the heat island effect. The strategies that can be used to reduce the heat island are: Vegetation – Green roofs – Roofing materials, including shading structures, having the following: · For roof pitched <15°– a three-year SRI of minimum 64 For roof pitched >15°– a three-year SRI of minimum 34 – Unshaded hard-scaping elements with a three-year SRI of minimum 34 or an initial SRI of minimum 39 – Hardscaping elements shaded by overhanging vegetation	1	Design Tender Construction
21 Upfront Carbon Emissions The building's upfront carbon emissions from materials and products have been reduced and offset	The building's upfront carbon emissions are at least 10% less than those of a reference building, calculated using the Upfront Carbon Emissions calculator.	MINIMUM EXPECTATION	Strategy Brief Concept Design
	The building's energy use is at least 20% less than a reference building, calculated using the Upfront Carbon Emissions calculator.	3	
	Where an existing building less than 30 years old has been fully or partly demolished for construction, an embodied carbon calculation must be done for the demolished portion and these emissions offset. Where the existing building is between 30 to 50 years old, the contribution must be calculated and discounted at 10% for every two additional years past year 30.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
22 Energy Use (Residential Pathway) The building has low energy consumption	The building has a weighted-area average of NatHERS 6.5 stars The building meets at least NatHERS 5 stars for each sole-occupancy unit The building addresses domestic hot water demand	MINIMUM EXPECTATION	Brief Concept Design Tender
	The building has a weighted-area average of NatHERS 7 Stars and at least NatHERS 5.5 Stars for each sole-occupancy unit. - - All NatHERS ratings certified and produced by an Accredited Assessor. The building addresses four out of nine building services energy initiatives as described in the submission guidelines.	3	
23 Energy Source The building's energy comes from renewables	The building provides a Zero Carbon Action Plan. The Zero Carbon Action Plan must include a target date by when the building is expected to operate as fossil fuel free. The Zero Carbon Action Plan must cover all energy consumption, procurement, and generation and cannot rely on procuring renewable fuels as its only solution. It must also include infrastructure provided for tenants or future occupants such as gas installations for cooking.	MINIMUM EXPECTATION	Brief Concept Design Tender
	100% of the building's electricity comes from renewable electricity	3	
	100% of the building's energy comes from renewables (all electric)	3	
25 Water Use The building has low water use	The building installs efficient water fixtures: Taps 5 star Toilets 4 star Urinals 5 star Showers 3 star (<= 7.5 l/m) Dishwashers 5 star	MINIMUM EXPECTATION	Design Tender Construction Use
27 Movement and Place The building's design and location encourage occupants	There are showers, lockers, and change rooms in the building	MINIMUM EXPECTATION	Strategy Brief Concept Design

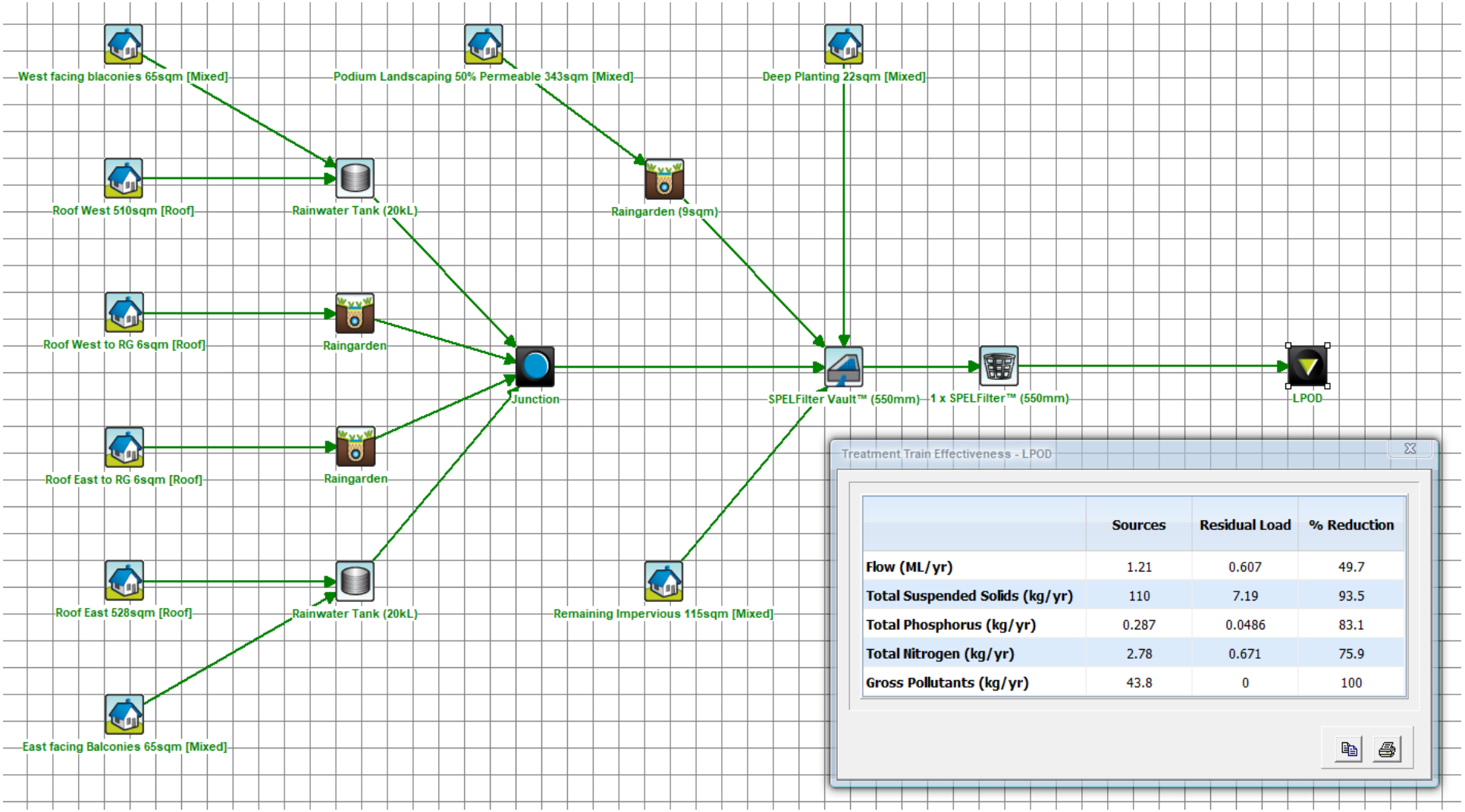
Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
and visitors to use active, low carbon, and public transport options instead of private vehicles	The facilities are accessible, inclusive, and located in a safe and protected space		Tender Construction
	The building's access prioritises cycling and includes bicycle parking facilities – 56secure bicycle spaces – Cycle maintenance rack and foot-pump – Staff EoT facilities including: – 1 shower, – 2 lockers – changing area with benching & ironing facilities Clear, safe and inclusive access to cyclist facilities via 2 lifts. 2-way ramp also provided (non-dedicated) – gradients of 1:10 or greater to incorporate minimum slip resistance classification of P5 in accordance with AS 4586.	3	
	Sustainable Transport Plan to be prepared and implemented.		
	EV charging infrastructure: – Chargers to 5% of car spaces: 2 chargers (minimum 7kW capacity) – EV charging to include load management supervisor hardware – Electrical containment e.g. trunking/conduit installed to facilitate future installation of cabling supplying a further 20% of car spaces (10 spaces)		
	Transport options that reduce the need for private fossil fuel powered vehicles are prioritised.		
	Walkability encouraged via access to at least 10 amenities across 5 categories		
29 Contribution to Place The building's design makes a positive contribution to the quality of the public environment	The project team must provide an urban context report and public realm interface design that outlines the urban context of the development and the design responses. or Independent design reviews are to be held at key points in the development of the design.	2	Strategy Brief Concept Design Construction

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
30 Culture, Heritage and Identity The building reflects local culture, heritage, and identity	The project team must show that they have undertaken local analysis to identify culture, heritage, and identity unique to the project site and area. The project team must undertake community engagement as part of this local analysis. As a result of community engagement, the project must reflect local identity, culture, and heritage in the design of the building in a publicly demonstrable way. It must be demonstrated that the International Association for Public Participation Australasia (IAP2) core values for public participation were used and that the project achieved the 'Collaborate' status. or Independent design reviews are to be held at key points in the development of the design.	1	Strategy Brief Concept Design Handover Use
31 Inclusive Construction Practices The builder's construction practices promote diversity and reduces physical and mental health impacts	There are provisions for providing gender appropriate facilities and personal protective equipment The head contractor also installs policies on-site to increase awareness and reduces instances of discrimination, racism, and bullying	MINIMUM EXPECTATION	Strategy Brief Tender Construction
	The head contractor must show that they have introduced programs and solutions to address Physical and Mental Health of potential site workers and sub-contractors based on a needs analysis. The project must provide an evaluation report to the client and sub-contractors on the effectiveness of the program.	2	
32 Indigenous Inclusion The building celebrates Aboriginal and Torres Strait Islander people, culture, and heritage.	Building's design and construction played a central role in delivery of ≥90% of targets in project owner's organisational Reconciliation Action Plan (RAP); or • Building design incorporates Australian Indigenous Design Charter guiding principles, including Indigenous Led representation in design creation. Both options require visible and inclusive participation of Aboriginal & Torres Strait Islander throughout project's life cycle.	2	Strategy Brief Concept Design Tender Construction
34 Design for Inclusion The building is welcoming to a diverse population and is welcoming to their needs	The building's design and construction must be able to be navigated and enjoyed by stakeholders of diverse ages, genders, and physical and mental abilities. This applies to common spaces, bathroom facilities, and amenities provided within the building.	2	Concept Design Tender Construction Handover Use
	The building was not built on, or significantly impacted, a site with a high ecological value	MINIMUM EXPE	Strategy

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
35 Impacts to Nature Ecological value is conserved and protected	The building's light pollution has been minimised. All outdoor lighting on the project complies with AS/NZS4282:2019 Control of the obtrusive effects of outdoor lighting.		Brief Concept Design
	There is ongoing monitoring, reporting, and management of the site's wetland ecosystem		
39 Waterway Protection Local waterways are protected, and the impacts of flooding and drought are reduced	The project demonstrates a reduction in average annual stormwater discharge (ML/yr) of 40% across the whole site (Refer to Appendix C.4 for discharge rates).	2	Concept Design Construction Handover
	Specified pollution reduction targets are met (Refer to Section 0 and 0 for MUSIC modelling results and assumptions)		
Total Green Star Points		**32**	
Green Star Rating		**4 Star**	

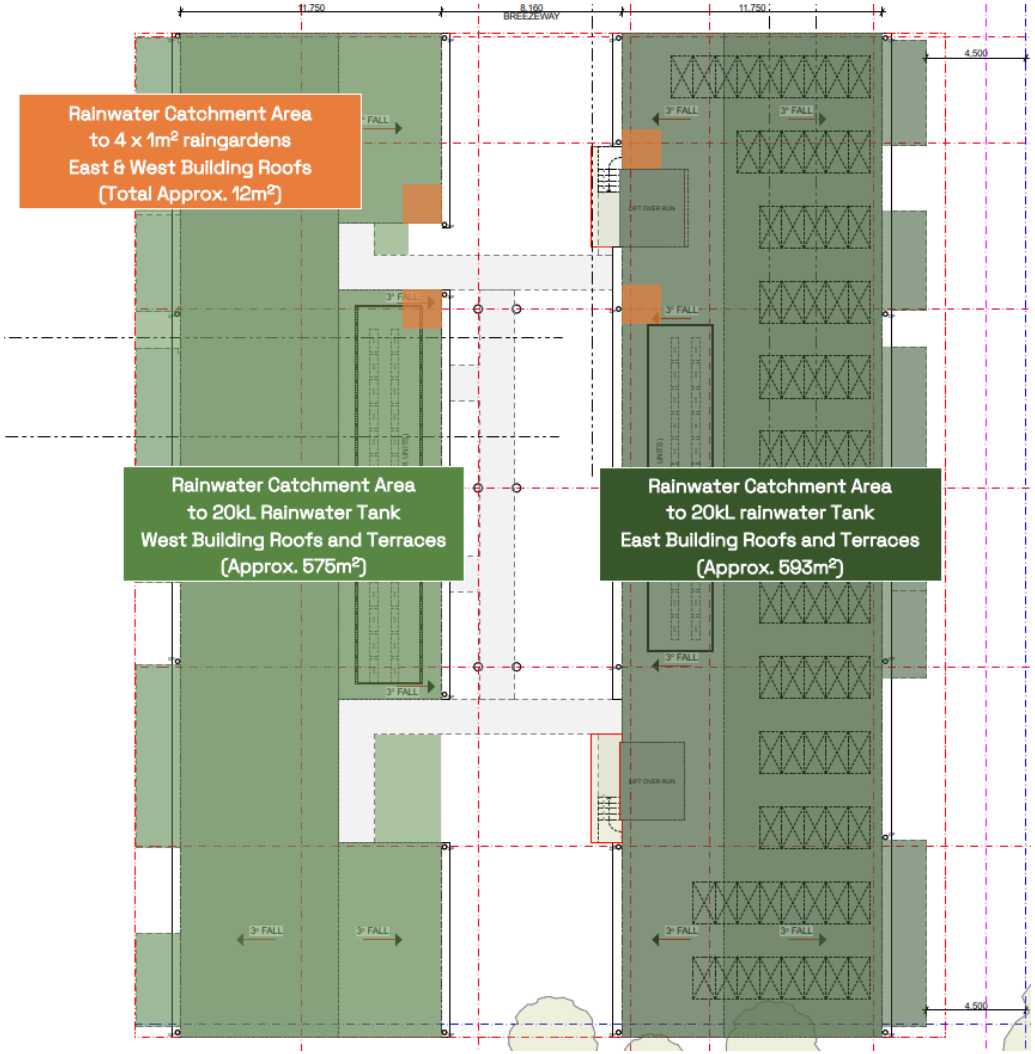
Appendix B. MUSIC Modelling

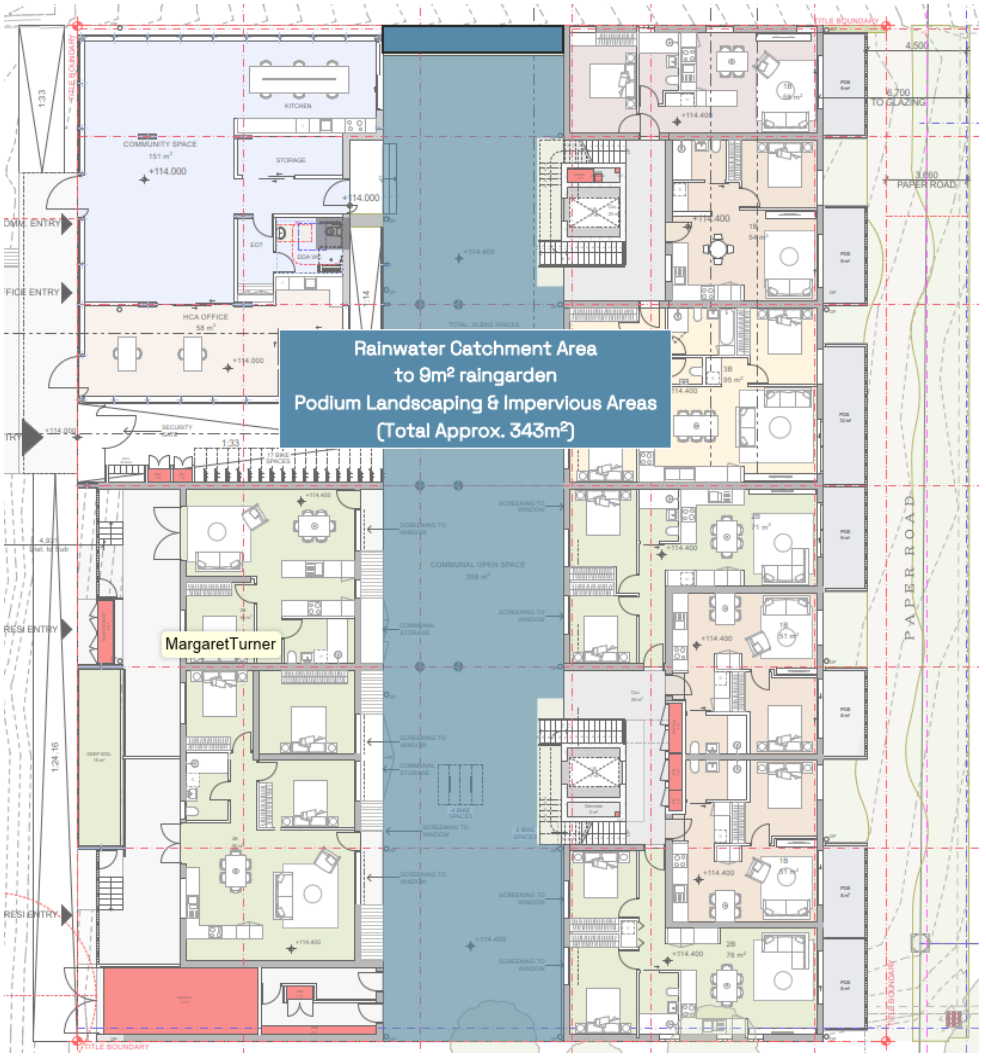
B.1 MUSIC Schematic



	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.21	0.607	49.7
Total Suspended Solids (kg/yr)	110	7.19	93.5
Total Phosphorus (kg/yr)	0.287	0.0486	83.1
Total Nitrogen (kg/yr)	2.78	0.671	75.9
Gross Pollutants (kg/yr)	43.8	0	100

B.2 Rainwater Catchment Areas





B.3 MUSIC Modelling Assumptions and Inputs

Area Name	Area [m^2]
Total Roof Areas to Rainwater Tank	1,168
Roof West Building	510
Balconies West Building	65
Roof East Building	528
Balconies East Building	65
Impervious Areas to Rain gardens	355
All Podium areas	343
Roof West Building	6
Roof East Building	6
Deep Landscape Areas	22
Remaining Area	115
Total Site Area	**1,661**

Treatment Devices Features	
RWT	2 x 20 kL
Total RWT Capacity	40 kL
Est. daily water demand West Bdg - All toilets	0.825 kL/day
Est. daily water demand East Bdg - All toilets	0.86 kL/day
Est. annual demand for irrigation	61 kL/yr
*Total RG surface area	13 m^2
** Treatment System 1 (GPT)	SPEL Stormfilter x 1 (or equivalent)

NOTES:

* RGs vegetated with Effective Nutrient Removal Plants. Further specification to be undertaken in Detailed Design.

**To be further specified during Detailed Design.

Acronyms

RWT: Rain Water Tank

RG: Rain Garden

TF: Toilet Flushing

Rainfall data	
Rainfall Range & Station Name	Warragul
10 Year Period	2011-2021
Mean annual rainfall	915mm
Time step	6 minutes
Estimation method	Stochastically generated

Soil properties - Warragul	
Soil store capacity	120mm
Field capacity	80mm

Rain Garden (Minor Podium)	
Filter Depth	500mm
Extended Detention Depth	100mm
Saturated Hydraulic Conductivity	100mm/hour
Underdrain present?	Yes

Rain Garden (Main North)	
Filter Depth	500mm
Extended Detention Depth	200mm
Saturated Hydraulic Conductivity	100mm/hour
Underdrain present?	Yes

Pollutant Removal Rates (SPELFilter)	
Total Suspended Solids	79%
Total Phosphorous	58%
Total Nitrogen	42%
Gross Pollutants	100%
Validation report	QUT August 2017

B.4 MUSIC Results

Pollutant	MUSIC Model Results	Green Star Building Targets (Credit Achievement)	Melbourne Water Targets
Reduction in Stormwater Discharge	49.7%	40.0%	-
Reduction in Total Suspended Solids (TSS)	93.5%	85.0%	80.0%
Reduction in Total Phosphorus (TP)	83.1%	65.0%	45.0%
Reduction in Total Nitrogen (TN)	75.9%	45.0%	45.0%
Reduction in Total Gross Pollutants	100.0%	90.0%	70.0%
Compliance with Project Targets		YES	YES

B.5 Rainwater Harvesting and Tank Reliability

Propert 18 Mason Street, Warragul
Version

Inputs:

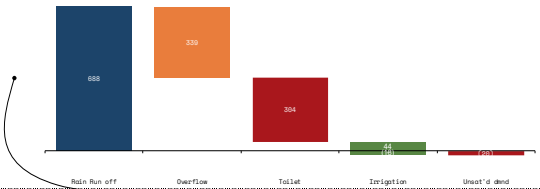
Commercial	Floor Area - NLA (m2)	151	
	PPL [M / F]	5	5
	Flush/Person/Day [M - Urin	2	
	Flush/Person/Day [M / F -	0.3	2.3
	Litres/Flush [Urinal / WC]	1	3.3
	Total Daily usage (litres)	53	
Residential	PPL	39	
	Flush/Person/Day	5	
	Litres/Flush	4	
	Total Daily usage (litres)	780	
Development	Total Daily usage (litres)	833	
	Roof area (m2)	1180	
	Collection Evaporation	5%	
	Tank Capacity (litres)	40000	
	Irrigation Area (m2)	160	
	T'off if Total Rain (mm)	10	
	in the last	5	days

Recalc, update pivots, table and graphs

Irrigation Schedule

	l /m2	S	M	T	W	Th	Fr	S
Jan	10		y			y		
Feb	10		y			y		
Mar	10		y			y		
Apr	5		y					
May	5			y				
Jun	5			y				
Jul	5				y			
Aug	5				y			
Sep	5					y		
Oct	5					y		
Nov	10						y	
Dec	10		y				y	

System components (kls per year)



System components (kls per year) based on 12 years of actual historical daily raintall

12 years of Averages (kl)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rain Run off	46	48	42	72	58	60	53	60	57	53	74	64	688
Overflow	(18)	(21)	(14)	(33)	(26)	(35)	(22)	(31)	(32)	(28)	(43)	(36)	(339)
Rain Water saved	28	27	28	39	32	24	31	29	25	25	31	28	348
Toilet	(26)	(24)	(26)	(25)	(26)	(25)	(26)	(26)	(25)	(26)	(25)	(26)	(304)
before Irrigation	3	4	2	14	6	(1)	6	3	0	(1)	6	2	44
Irrigation	(11)	(10)	(11)	(2)	(2)	(2)	(3)	(2)	(2)	(2)	(4)	(9)	(61.9)
Unsatisfied Demand	(8)	(6)	(9)	12	4	(3)	3	1	(2)	(3)	2	(7)	(18)

Actual Years (kl)

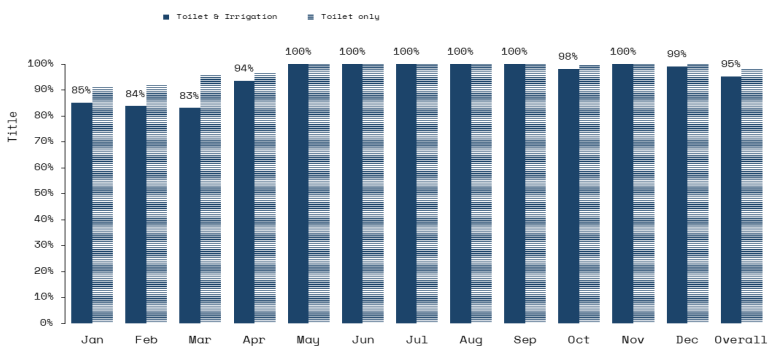
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Rain Run off	561	875	868	706	760	531	546	756	700	627	468	854	8,253
Overflow	(233)	(422)	(408)	(353)	(410)	(210)	(184)	(380)	(349)	(271)	(174)	(478)	(4,072)
Rain Water saved	328	353	360	353	350	322	363	376	350	356	295	375	4,181
Toilet	(304)	(304)	(304)	(305)	(304)	(304)	(304)	(305)	(304)	(304)	(304)	(303)	(3,650)
before Irrigation	24	49	56	48	46	18	58	72	46	51	(10)	72	530
Irrigation	(68)	(56)	(58)	(61)	(60)	(65)	(62)	(69)	(60)	(66)	(75)	(52)	(742)
Unsatisfied Demand	(44)	(7)	(1)	(13)	(14)	(47)	(4)	12	(14)	(15)	(85)	20	(212)

Back 2

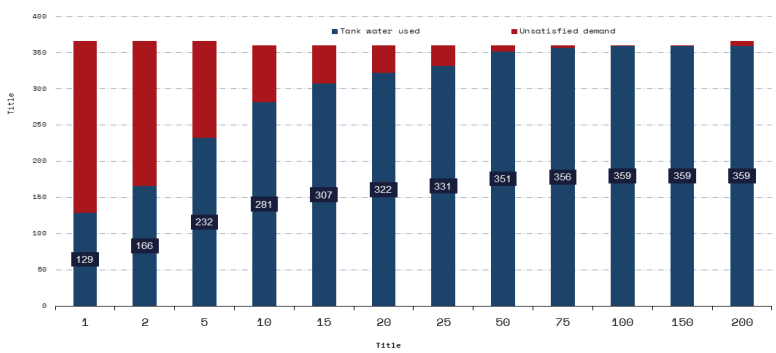
Reliability of supply (daily demand met)- Tank size what ifs

Tank	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
1k	22%	20%	21%	28%	32%	39%	45%	47%	38%	37%	31%	26%	33%
2k	27%	27%	28%	38%	56%	53%	58%	60%	49%	48%	39%	36%	43%
5k	38%	45%	42%	62%	81%	81%	81%	88%	71%	72%	59%	57%	65%
10k	50%	59%	52%	80%	93%	95%	91%	97%	88%	84%	73%	77%	78%
20k	68%	77%	65%	91%	100%	100%	98%	100%	98%	90%	90%	91%	89%
50k	91%	85%	86%	96%	100%	100%	100%	100%	100%	100%	100%	100%	97%
100k	92%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%
200k	92%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%

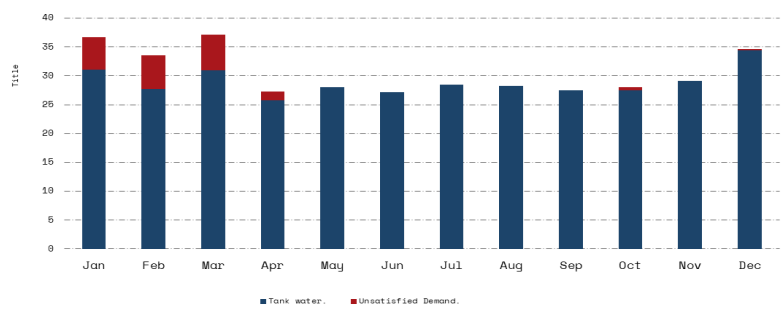
Graph 2 - Reliability of supply from tank (average across 12 years)



Graph 3 -Tank water used (per year) V Tank size Kls per year



Graph 4 - Tank water used v unsatisfied demand by month (kls per month)



Appendix C. NatHERS Energy Rating Assumptions

C.1 Building Materials

Element	Description	Added R Value
Floor Type	Suspended concrete slab	
Floor Insulation	50mm Kingspan Kooltherm: Underside of ground floor apartments with unconditioned space below i.e. garage, storage areas, bike parking, etc.	R 2.3
	50mm Kingspan Kooltherm: Underside of Level 1 floor apartments shared with unconditioned space or outside below	R 2.3
Wall Insulation	Lightweight party walls: Insulation R 2.0	R 2.0
	Brick veneer external walls: Insulation R 2.5	R 2.5
	Lightweight clad walls: Insulation R 2.5	R 2.5
Wall Colour	Solar Absorptance – 0.39 (Light – In line with recommendations of Daylight Assessment)	
Roof Insulation	Lightweight construction, metal deck roof: R 4.0 bulk insulation + antiglare foil under roof sheeting	R 4.0
	All apartment concrete ceilings shared with terraces above: 50mm Kingspan Kooltherm R 2.30 insulation	R 2.30
Roof Colour	Solar Absorptance – Surf Mist 0.32 (Light)	
Window Frames	Aluminium frames to all windows and glazed doors	
Window Colour	Solar Absorptance – Evening Haze 0.43 (Medium)	
Sky Lights	None	

NOTES

The added insulation R value must be equal to or higher than that specified above to meet the energy rating results.

All insulation specified for construction must meet Fire Engineer requirements.

C.2 Glazing

Window Type	Description	Whole of Window Value		Location
		U	**SHGC**	
Aluminium Fixed Window	CAP-055-18 Capral 419 Series Double glazed 6mm Clear/12mm Air gap/6mm Energy Advantage	2.91	0.58	As per floor plans & window schedule
Aluminium Awning Window	CAP-051-03 Capral 35 Series Double glazed 6mm Energy Advantage/12mm Air gap/6mm Clear	4.55	0.41	As per floor plans & window schedule
Aluminium Sliding Door	CAP-057-05 Capral 900 Series Double glazed 6mm Energy Advantage/12mm Air gap/6mm Clear	3.37	0.48	As per floor plans & window schedule

GLAZING NOTES

The energy rating software accredited by the Australian Building Codes Board contains a relatively limited library of window systems. When the glazing systems specified are not available in the software, the protocol requires that the glazing type which most closely matches the specified glazing is selected for the purpose of calculating the energy rating.

The table above sets out the glazing specified for the purposes of calculating the energy rating.

The whole of window U – Value must be equal or lower than the energy rating software value and the whole of window SHGC – Value must be within +/-5% of the energy rating software value.

C.3 General Rating Assumptions

Item	Details
Floor Coverings	Tiles to bathrooms and laundries Carpet to bedrooms Timber boards to kitchen, living and all other areas
Draught Proofing	Weather strips to all entry & external doors and windows. Seal all exhaust fans.
Down lights	Recessed down lights in ceiling /roof space to be fitted with fire proof unvented down light covers (external roof areas only) to provide air tightness and contact with insulation
General	All party walls are classed as neighbour walls.
Shading	Overshadowing from adjoining buildings has been incorporated into the energy ratings
Ceiling Calculation	Calculation for loss of ceiling insulation due to down lights, exhaust fans, ceiling speakers etc. have been incorporated into the energy rating where applicable

NOTES

Changes to any of the above stated specifications may affect energy performance and invalidate the energy ratings detailed in this report.

Sealing of gaps and cracks: inadequate sealing of gaps and cracks can negatively affect the energy performance of a dwelling. Provide sealing in accordance with NCC 2019 Part J3.


Operable window
Operable window
2,000
11,750
8,160
BREEZEWAY
11,750
2,000
840
Horizontal awning blind 1800mm outstretched
Horizontal awning blind 1800mm outstretched
Horizontal awning blind 1800mm outstretched
Horizontal awning blind 1800mm outstretched
4,500
6,700
TO GLAZING
AWNING BELOW
SCREENING TO WINDOW
WALK WAY ACCESS FOR EMERGENCY & MAINTENANCE USE ONLY
Energy Rating Requirements
1. Maximum Solar Absorptance value for window frames = 0.43 (Colorbond Evening Haze)
2. Horizontal awning blinds to some apartments on Level 3. These can be added to all apartments for consistency but only needed to ones shown on markup.
3. Add operable windows to kitchen as shown on markup (north facade Level 3 only)
03-05-2023
7,500
8,100
8,100
8,100
4,500
3.14
3.13
3.12
3.11
3.10
3.09
3.08
3.01
3.02
3.03
3.04
3.05
3.06
3.07

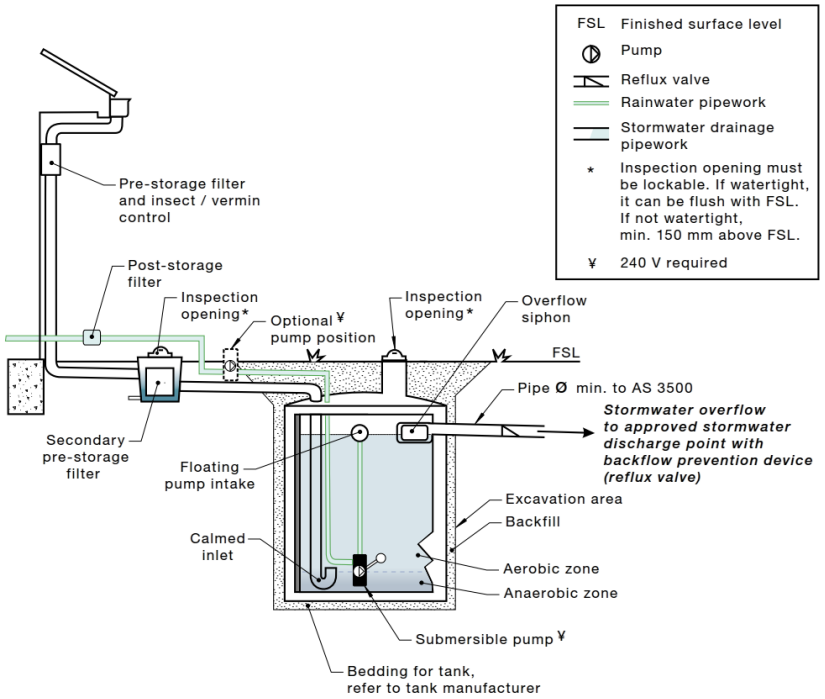
Once installed, a systematic maintenance program will be implemented by the owner's corporation maintenance contractor to ensure the rainwater harvesting system operates as designed and water quality is maintained.

The scope of the maintenance program will include inspection and rectification of issues associated with:

- Roof gutters and downpipes
- First flush screens and filtration devices
- Pumps
- Distribution pipework and reticulation systems
- Overflow systems

Inspections of the system and any maintenance works required will be undertaken on a quarterly basis or as per manufacturers guidelines.

The rainwater harvesting system will be installed in accordance with the guidelines set out in the Rainwater Design & Installation Handbook published by the National Water Commission[1]. A schematic diagram of the rainwater tank installation is provided below.



Rainwater Tank Element	Inspection Item	Y/N	Likely Maintenance Task
Roof gutters and downpipes	Is there leaf litter or debris in the gutters?		Remove by hand and dispose responsibly
First flush diverter	Is there anything blocking the first flush diverter (Leaves etc.)?		Remove by hand and dispose responsibly
Potable mains back up device	Is the potable mains back up switch operating correctly?		Repair or replace devise. Consider a manual switching device.
Mesh cover	Has the mesh cover deteriorated or have any holes in is?		Replace mesh cover.
Tank volume	Is there large amounts of sediment or debris sitting in the bottom of the tank, reducing the volume available in the tank to store water?		Remove sediment and dispose responsibly.
Pump	Is the pump working effectively? Have you heard it on a regular basis?		Check the potable mains back up is not permanently on. Repair or replace pump.
Pipes and taps	Are pipes and taps leaking?		Repair as needed.
Overflow	Is the overflow clear and connected to the storm water network?		Remove blockages and/or restore connections to stormwater network.

Maintenance Frequency												
	J	F	M	A	M	J	J	A	S	O	N	D
All tasks	X			X			X			X		

Appendix E. Solar Photovoltaics

During the construction phase, high-efficiency solar PV modules with a total capacity of 64 kWp will be installed at roof level as per the preliminary layout indicated below.

PV modules should be oriented in pairs to the east and west at 10-15° tilt and have at least 400Wp capacity (i.e. over 33% more efficient than traditional 300Wp 60-cell modules). High-efficiency modules deliver more compact arrays with inherently lower embodied ecological impact per unit of generation than standard efficiency modules.

The undulating east-west configuration prevents self-shadowing of the array and provides a low-profile installation with maximised packing factor. It also helps maximise self-consumption due to its flatter and broader power output yield profile.

Total yield of this array will be approximately 69 MWh per annum equating to an estimated annual carbon emissions offset of 69 tonnes C02-e per annum.

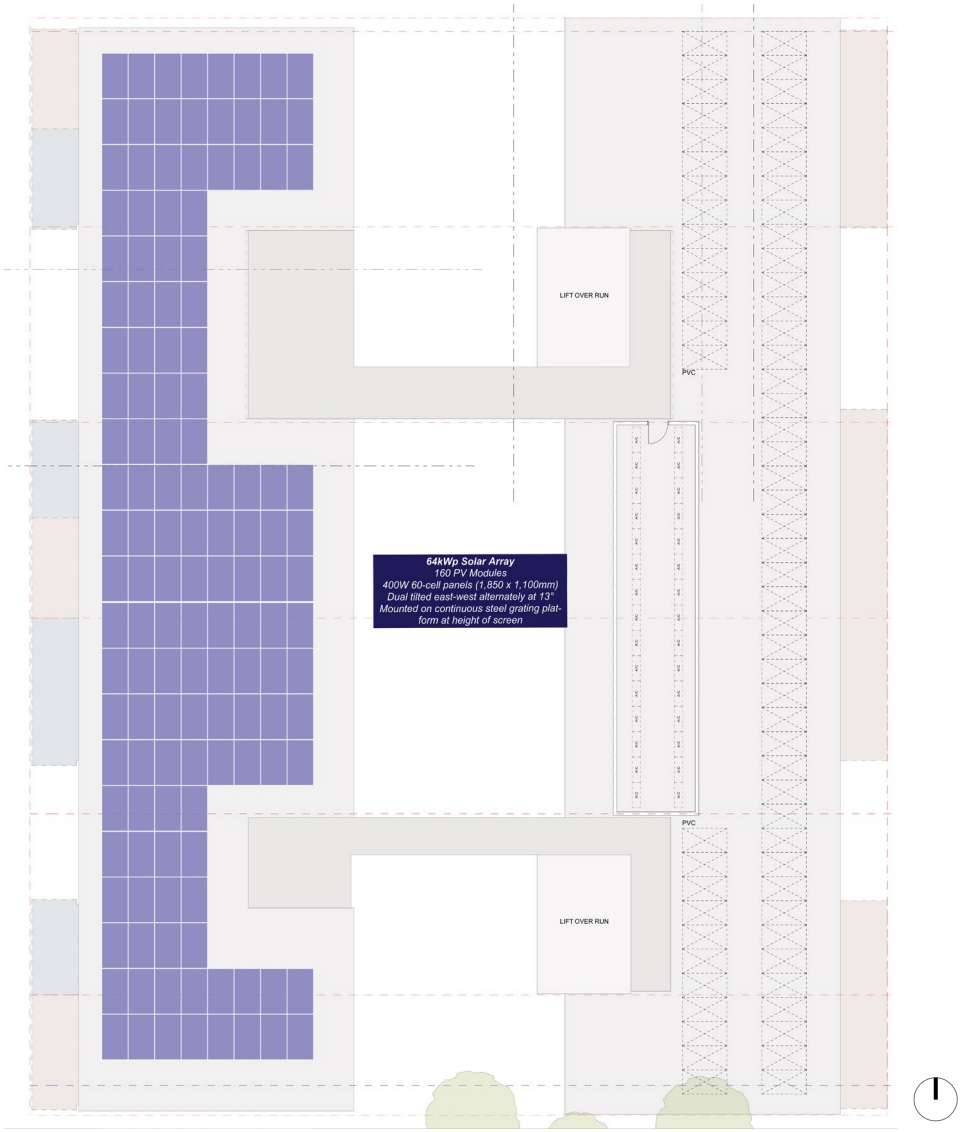


Figure 1 Indicative Solar Photovoltaic array layout

East facing array output

RESULTS

33,590 kWh/Year*

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	6.61	4,677
February	5.71	3,704
March	4.24	3,128
April	2.96	2,131
May	1.82	1,364
June	1.67	1,214
July	1.60	1,222
August	2.38	1,823
September	3.48	2,546
October	4.66	3,466
November	5.40	3,815
December	6.27	4,501
Annual	3.90	33,591

Location and Station Identification	
Requested Location	18 Mason St warragul victoria australia
Weather Data Source	Lat, Lng: -38.15, 145.94 1.0 mi
Latitude	38.15° S
Longitude	145.94° E

PV System Specifications	
DC System Size	32 kW
Module Type	Premium
Array Type	Fixed (open rack)
System Losses	14.08%
Array Tilt	13°
Array Azimuth	107°
DC to AC Size Ratio	1.2
Inverter Efficiency	96%
Ground Coverage Ratio	0.4%
Albedo	*From weather file*
Bifacial	No (0)

Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics	
DC Capacity Factor	12.0%

West facing array output

RESULTS

35,760 kWh/Year*

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	6.86	4,835
February	5.98	3,864
March	4.49	3,298
April	3.30	2,378
May	2.15	1,633
June	1.98	1,472
July	1.74	1,339
August	2.76	2,126
September	3.84	2,812
October	4.77	3,526
November	5.55	3,904
December	6.41	4,573
Annual	4.15	35,760

Location and Station Identification	
Requested Location	18 Mason St warragul victoria australia
Weather Data Source	Lat, Lng: -38.15, 145.94 1.0 mi
Latitude	38.15° S
Longitude	145.94° E

PV System Specifications	
DC System Size	32 kW
Module Type	Premium
Array Type	Fixed (open rack)
System Losses	14.08%
Array Tilt	13°
Array Azimuth	287°
DC to AC Size Ratio	1.2
Inverter Efficiency	96%
Ground Coverage Ratio	0.4%
Albedo	*From weather file*
Bifacial	No (0)

Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics	
DC Capacity Factor	12.8%

During the construction phase, the key pollutants at risk of entering the stormwater system include:

- Sediments (soil, sand, gravel and concrete washings); and
- Litter, debris etc.

These pollutants arise from factors such as dirt from construction vehicles, stockpiles located close to surface runoff flow paths, and surface runoff from disturbed areas during earthmoving and construction works. It is therefore important to have measures that either prevent or minimise the pollutant loads entering stormwater system during construction.

In order to mitigate the impacts of the above pollutants on the stormwater system, the following stormwater management strategies will be implemented during the construction phase as appropriate:

- Installation of onsite erosion and sediment control measures. All installed control measures shall be regularly inspected & maintained to ensure their effectiveness. Such measures may include (but not limited to):
  - Silt fences
  - sediment traps
  - hay bales
  - geotextile fabrics
- Where possible, litter bins with a lid will be used to prevent litter from getting blown away and potentially entering stormwater drains.

Additionally, the following work practices shall be adopted to reduce stormwater pollution:

- Site induction by the head contractor/ builder to make personnel aware of stormwater management measures in place
- Employ suitable measures to reduce mud being carried off-site into the roadways such as installing a rumble grid/ gravel/ crushed-rock driveway (or equivalent measure) to provide clean access for delivery vehicles, removing mud from vehicle tyres with a shovel etc.
- Safe handling and storage of chemicals, paints, oils and other elements that could wash off site to prevent them from entering stormwater drains.
- Where practicable, stockpiles will be covered, located within the site's fence and away from the lowest point of the site where surface runoff will drain to. This initiative will minimise erosion.

Accordingly, the measures presented above are considered appropriate for the proposed development at this stage of the project. The measures will reduce the pollutants entering stormwater system from the site during construction works thereby protecting waterways.

Appendix G. Daylight Assessment

This Appendix provides a summary of internal daylight levels within bedrooms and living/ kitchen areas of the proposed development.

- Analysis of Internal Daylight Levels bedrooms and living/ kitchen areas on Ground floor and Level 1 within the proposed residential development at 18 Mason Street, Warragul.
- The model accounts for shading and obstructions provided by adjacent structures.

The daylight assessment set out in this report is based on:

- Architectural drawings set by Freadman White Architects issued to Ark Resources on 11.04.23 dated 11.04.2023
- Equitable development scenario provided by Tract Planners on 11.04.2023.

Living/Kitchen Areas

Table 1 Overall Development Living/Kitchen Daylight Factor Results

Level	Total of Rooms	Rooms meeting 'best practice'	% of rooms meeting 'best practice'	Reasoning
Ground Floor	9	3	33	Tested
Level 01	14	12	86	Tested
Level 02	14	13	93	Increased height leads to improved angle of daylight penetration
Level 03	14	14	100	Increased height leads to improved angle of daylight penetration
Total	51	42	**82%**	

Bedrooms

Table 2 Overall Development Bedroom Daylight Factor Results

Level	Total of Rooms	Rooms meeting 'best practice'	% of rooms meeting 'best practice'	Reasoning
Ground Floor	15	14	93	Tested
Level 01	23	20	87	Tested
Level 02	23	20	87	Increased height leads to improved angle of daylight penetration
Level 03	23	23	100	Increased height leads to improved angle of daylight penetration
Total	84	77	**92%**	

Results for Levels 2 and 3 have been extrapolated based on results for the levels below and confirm that, on a whole of development basis, **82%** of living/kitchen areas and **92%** of bedrooms in the development meet the best practice daylight standard and thus the development does meet the daylight requirements of the BESS sustainability tool.

G.1 Results

Kitchen/ Living Areas

Room	Level	DF % > 1
G.01	Ground Floor	100
G.02	Ground Floor	82.1
G.03	Ground Floor	60.6
G.04	Ground Floor	82.7
G.05	Ground Floor	80.9
G.06	Ground Floor	100
G.07	Ground Floor	100
G.08	Ground Floor	86.5
G.09	Ground Floor	54.4
L1.01	Level 01	100
L1.02	Level 01	87.7
L1.03	Level 01	63.1
L1.04	Level 01	96.9
L1.05	Level 01	90.7
L1.06	Level 01	99.8
L1.07	Level 01	100
L1.08	Level 01	95.8
L1.09	Level 01	100
L1.10	Level 01	100
L1.11	Level 01	97.4
L1.12	Level 01	98.4
L1.13	Level 01	100
L1.14	Level 01	100

Bedrooms

Room	Level	DF % > 0.5
G.01. Bed 01	Ground Floor	97.4
G.02. Bed 01	Ground Floor	100
G.03. Bed 01	Ground Floor	100
G.03. Bed 02	Ground Floor	100
G.03. Bed 03	Ground Floor	98.7
G.04. Bed 01	Ground Floor	99.1
G.04. Bed 02	Ground Floor	98.3
G.05. Bed 01	Ground Floor	100
G.06. Bed 01	Ground Floor	100
G.07. Bed 01	Ground Floor	100
G.07. Bed 02	Ground Floor	100
G.08. Bed 01	Ground Floor	97.7
G.08. Bed 02	Ground Floor	97.4
G.09. Bed 01	Ground Floor	65.7
G.09. Bed 02	Ground Floor	98.2
L1.01. Bed 01	Level 01	100
L1.02. Bed 01	Level 01	100
L1.03. Bed 01	Level 01	100
L1.03. Bed 02	Level 01	100
L1.03. Bed 03	Level 01	100
L1.04. Bed 01	Level 01	97.5
L1.04. Bed 02	Level 01	98.1
L1.05. Bed 01	Level 01	100
L1.06. Bed 01	Level 01	100

Room	Level	DF % > 0.5
L1.07. Bed 01	Level 01	100
L1.07. Bed 02	Level 01	100
L1.08. Bed 01	Level 01	100
L1.08. Bed 02	Level 01	100
L1.09. Bed 01	Level 01	100
L1.10. Bed 01	Level 01	100
L1.11. Bed 01	Level 01	74.8
L1.11. Bed 02	Level 01	95.0
L1.12. Bed 01	Level 01	100
L1.12. Bed 02	Level 01	64.2
L1.12. Bed 03	Level 01	50.4
L1.13. Bed 01	Level 01	100
L1.14. Bed 01	Level 01	100
L1.14. Bed 02	Level 01	100

G.3 Model Images

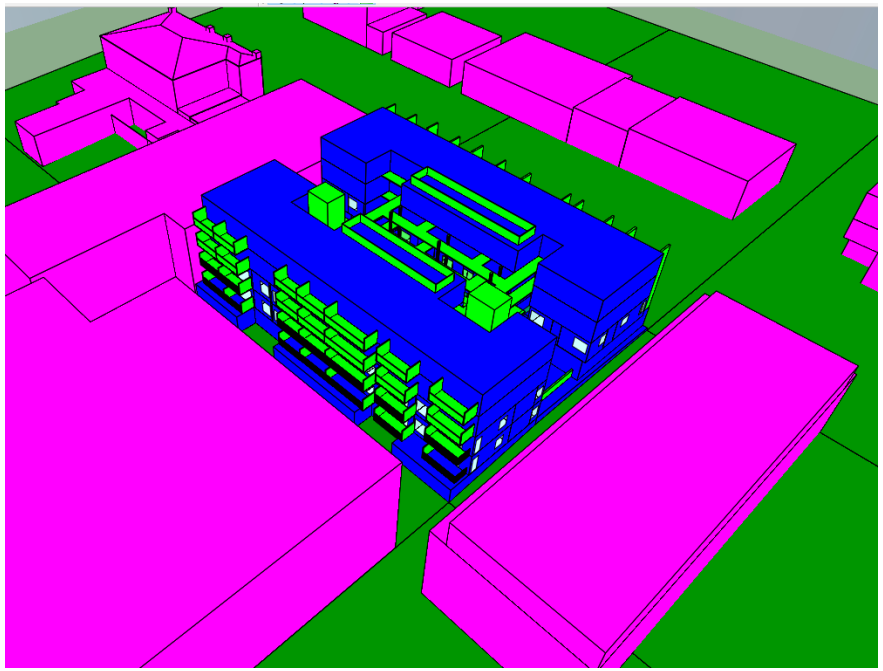


Figure 1 Model view from North-East

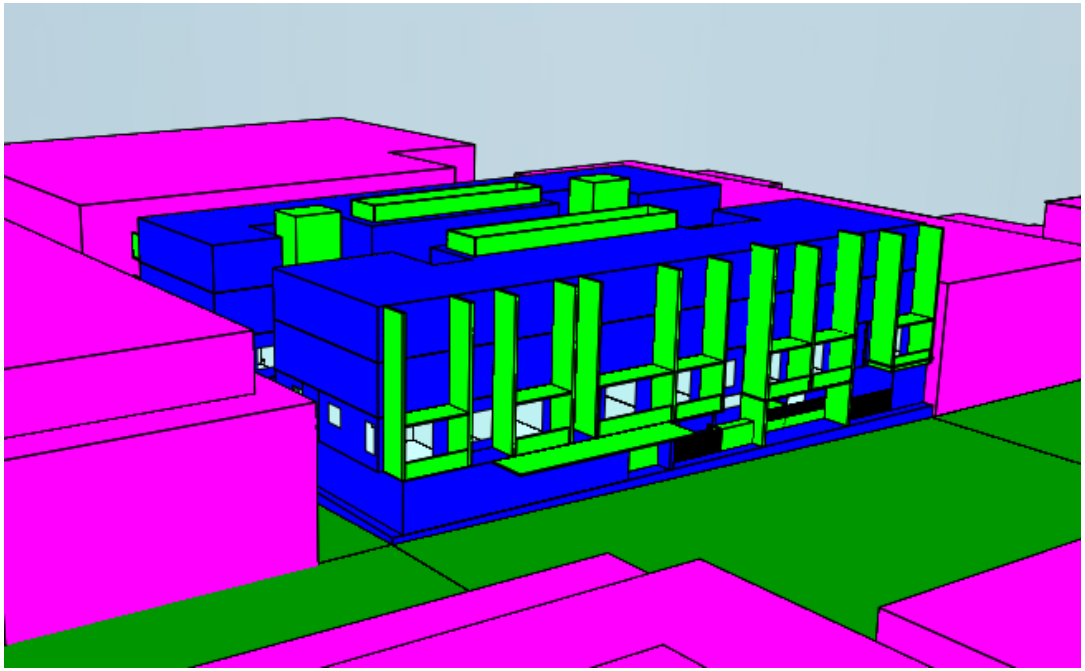
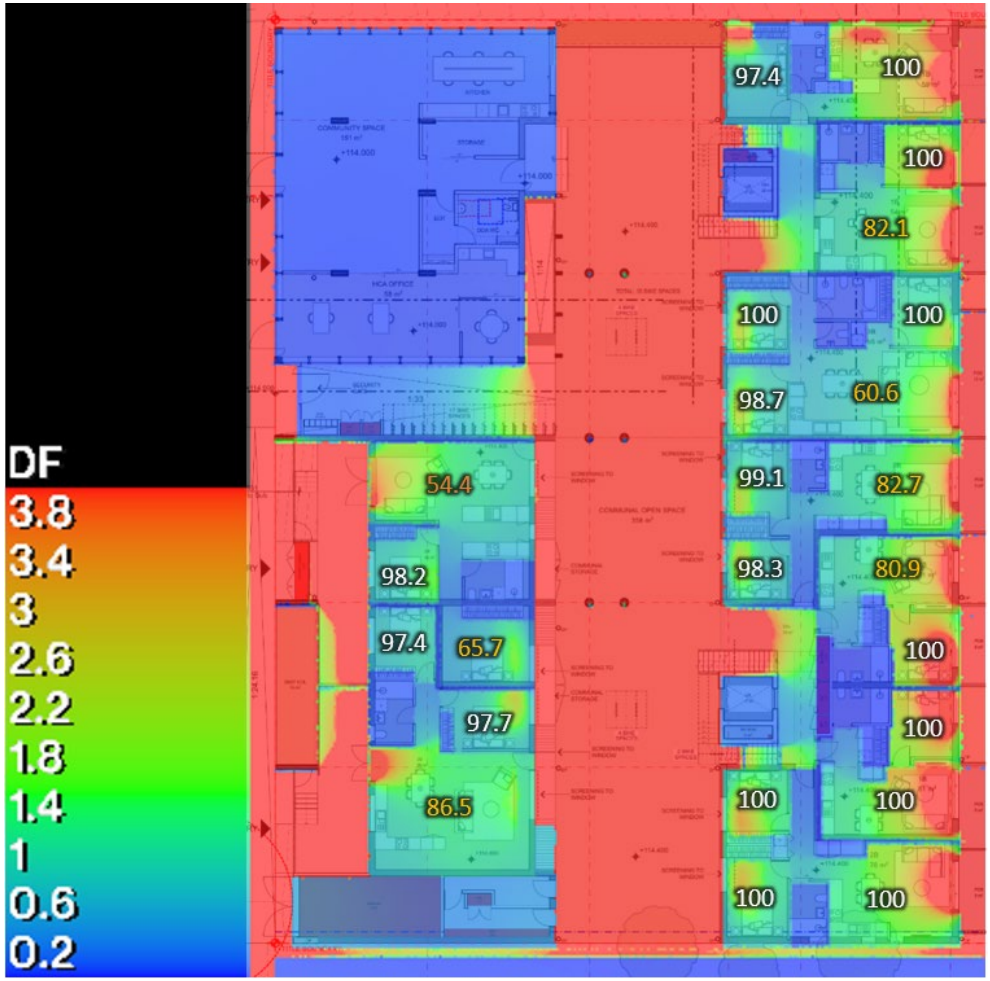
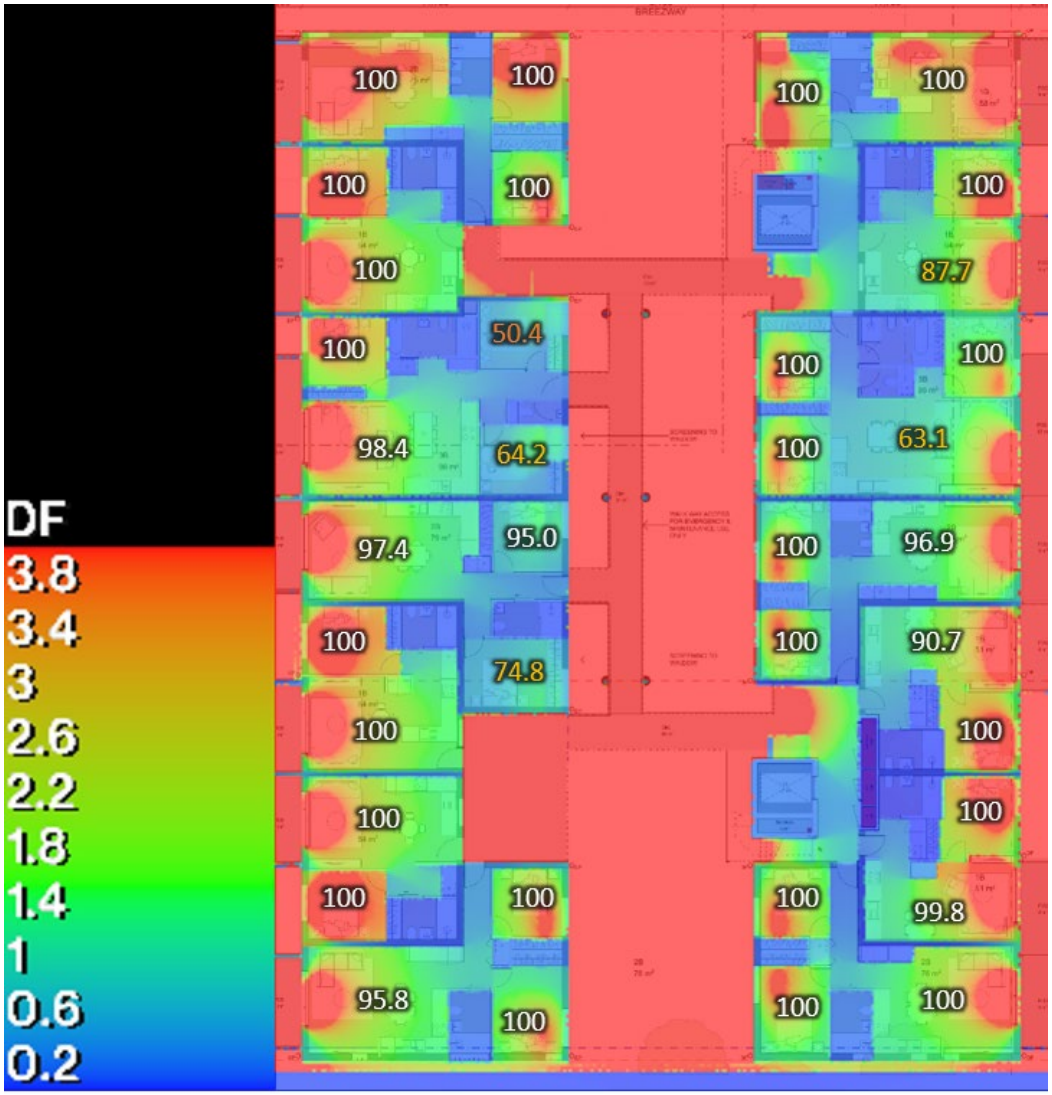


Figure 2 Model view from South-East

G.4 Daylight Contour Plots



Ground Floor


DF
3.8
3.4
3
2.6
2.2
1.8
1.4
1
0.6
0.2
100
100
100
100
100
100
100
100
87.7
100
50.4
100
100
98.4
64.2
100
63.1
97.4
95.0
100
96.9
100
100
90.7
74.8
100
100
100
100
100
100
99.8
95.8
100
100
100

Level 01

G.5 Assumptions

The following assumptions have been made for the Visible Light Transmittance (VLT) values for all glazing applicable to this analysis:

Assumed Glazing Visual Light Transmittance

Glazing Type	Visible Light Transmittance (VLT)
	%
External Glazing. Clear, Double Glazing	70
External Glazing. Obscure up to 1700mm above FFL, Internal Communal space.	60
Screening	80

Assumed Surface Reflectances

Construction Element	Reflectance (%)	Description
Floors	40	Assumes a light-coloured timber/carpet
Internal Walls	94	Dulux Vivid White paint
Ceilings	94	Dulux Vivid White paint
External Walls	60	Light-coloured finish
Balustrade	50	Light-coloured finish
Adjacent Buildings	40	Red brick
Roads	10	Dark colour

Sky conditions: 10K Lux CIE overcast sky.

Appendix H. Preliminary JV3 Simulation

A preliminary energy simulation has been undertaken to demonstrate compliance of the proposed mixed-use redevelopment with Section J0 (Energy Efficiency) and Section J1 (Building Fabric) of the NCC 2019 (Volume One).

The verification method requires a reference case building, based on NCC 2019 Section J Deemed-to-satisfy (DTS) provisions, to be compared against the proposed building to determine the comparative difference between the energy consumption of the two models.

H.1 Results

As shown in Table 2 below, the annual Greenhouse Gas Emissions of the proposed building is less than the reference building, when the proposed building is modelled with the proposed fabric and services compliant with the Deemed to Satisfy conditions of the National Construction Code 2019 Section J (Energy Efficiency).

As a result, the JV3 analysis demonstrates that the proposed design achieves compliance with Part J1 Building Fabric of NCC 2019, based on the design and modelling assumptions set out in this report.

Building Fabric Only (Cooling and Heating Loads)

The comparative heating and cooling loads of the reference and proposed buildings is summarised in Table 1 Space Conditioning Loads (Building fabric only)

below:

Building	**Heating Plant (MWh/yr)** *Sensible Load*	**Cooling Plant (MWh/yr)** *Sensible + Latent Loads*	**Total (MWh/yr)**
Reference	9.9	3.6	13.5
Proposed	7.7	5.4	13.1

Table 1 Space Conditioning Loads (Building fabric only)

Greenhouse Gas emissions

The comparative Greenhouse Gas emissions of the reference and proposed buildings is summarised in Table 2 Greenhouse Gas Emissions for the Reference and Proposed Model

below. The calculation of the greenhouse gas emissions is based on the air conditioning efficiency (EER=2.9) and Electricity Greenhouse Gas Emissions factor of 1KgCO2-e/kWh according to NCC 2019 Specification JVb Specification table 3a.

Building	**Reference Building Total** (KgCO2-e/year)	**Proposed Building Total** (KgCO2-e/year)	**GHG Emissions % Reduction**
Building	4,658	4,529	2.8%

Table 2 Greenhouse Gas Emissions for the Reference and Proposed Model

H.2 Simulation Details and Assumptions

Details about building fabric, equipment and services used, including assumptions made, are provided below.

Item	NCC Reference Case Building	Proposed Building with DTS Services
Climate Data	Climate Zone 0612, East Sale (TMY)	As per reference case.
Operating Conditions	(A)18°CDB to 25°CDB for conditioned spaces with transitory occupancy; and. (B) 21°CDB to 24°CDB in all other conditioned spaces.	As per reference case.
Plant Operating Profile	Operation schedule as per NCC 2019 specification JVc Modelling Profiles.	As per reference case.
Internal Gains People and hot meals	Number of people calculated in accordance with D1.13 of NCC 2019. – 10m^2/person for Office/ Kitchen – 30m^2/person for Carpark, plant room, storage space – 1m^2/person for Public hall Internal heat gain values as per NCC specification JVc Table 2n – Sensible heat gain 75 W/person – Latent heat gain 55 W/person Operation schedule as per NCC specification JVc.	As per reference case.
Lighting	Maximum illumination power density for lighting as per Table J6.2a NCC 2019. – 8 W/m^2 for Public hall – 1.5 W/m^2 for Storage space – 2 W/m^2 for Carpark (general) – 3 W/m^2 for Toilet – 4 W/m^2 for Kitchen – 4.5 W/m^2 for Office Operation schedule as per NCC specification JVc.	As per reference case.
Internal Heat Gains for Appliances and Equipment	Internal Heat Gains for Appliances and Equipment as per NCC specification JVc Table 2L. – Class 5 office: 11 W/m^2 – Other Applications: No load	As per reference case.
HVAC system	Air cooled Variable Refrigerant Systems must comply with MEPS and for capacity greater than or equal to 65kW have minimum energy efficiency ratio EER of 2.9 for cooling.	As per reference case.

Item	NCC Reference Case Building	Proposed Building with DTS Services
Infiltration values	– 0.7 air changes an hour throughout all zones when there is no mechanically ventilated supplied outdoor air. – 0.35 air changes an hour all other times.	As per reference case.
External shading	Shading from other buildings, overhang structures and external shading devices have been incorporated into the analysis.	As per reference case.
Insulation[1]	As per deemed-to Satisfy requirements. See below:	See detailed information below.
Roof	As per deemed-to Satisfy requirements. NCC 2019 Section J1.3 (a) – Total system R Value R3.2 – 0.45 External surface absorptance	Insulated ceilings: 100mm R4.60 continuous PIR rigid insulation **Total system R value: R4.8** See H.8 for insulation markup. Other roof areas: Uninsulated
Internal walls	As per deemed-to Satisfy requirements. – Total system U value of wall-glazing construction must not be greater than U2.0 as per Section J1.5 (a) Total R Value of Wall components must achieve a minimum Total R value of: – R1.0 when window to wall ratio is greater than 20% – R1.4 when window to wall ratio is 20% or less – Refer to **Error! Reference source not found.** for reference building Wall-Glazing calculator details	Insulated internal walls: 50mm R2.3 continuous PIR rigid insulation **Total system R value: R2.5** See H.8 for insulation markup. Other walls: Uninsulated (Includes thermal bridging calculated according to NZS4214)

Item	NCC Reference Case Building	Proposed Building with DTS Services
External walls	As per deemed-to Satisfy requirements. – Total system U value of wall-glazing construction must not be greater than U2.0 as per Section J1.5 (a) Total R Value of Wall components must achieve a minimum Total R value of: – R1.0 when window to wall ratio is greater than 20% – R1.4 when window to wall ratio is 20% or less – 0.6 Solar absorptance Refer to **Error! Reference source not found.** for reference building Wall-Glazing calculator details	Insulated external walls: 50mm R2.3 continuous PIR rigid insulation **Total system R value: R2.5** See H.8 for insulation markup. Other walls: Uninsulated (Includes thermal bridging calculated according to NZS4214)
Floor	As per deemed-to Satisfy requirements. – A floor must achieve a total R-value as per NCC 2019 Section J table J1.6 – Total system R-Value R2.0 (For the purpose of calculating the *Total R-Value* of a floor, the sub-floor and soil *R-Value* must be calculated in accordance with Specification J1.6)	Insulated slabs: 100mm R4.60 continuous PIR rigid insulation **Total system R value: R4.8** See H.8 for insulation markup. Other floors: Uninsulated.

Item	NCC Reference Case Building	Proposed Building with DTS Services
External Glazing	Glazing / polycarbonate areas as per elevations As per DTS J1.5 Compliance. Glazing properties according to the wall-glazing calculator spreadsheet shown in H.7. U 2.37 SHGC 0.20	**Whole of Window Properties:** <u>Fixed windows</u> **U 2.70** **SHGC 0.26** 24mm InsulglassMax 564-Air (or equivalent) Non-thermally broken frame (Capral 419 series or equivalent) <u>Hinged Door</u> **U 3.60** **SHGC 0.21** 24mm InsulglassMax 564-Air (or equivalent) Non-thermally broken frame (Capral 200 series or equivalent) <u>Sliding Windows</u> **U 3.72** **SHGC 0.22** 24mm Insulglass Max 564-Argon (or equivalent) Non-thermally broken frame (Capral 950 series or equivalent) Note that any glazing product may be used provided the whole of window U-value of the nominated product is less than the value above and the SHGC is within +/-5% of the nominated value.

Please refer to H.7 for the relevant NCC J1.5 Deemed to Satisfy (DTS) Wall-Glazing Calculators.

Includes thermal bridging calculated according to NZS4214. All constructions were air film resistance as per specification J1.2 Table 2b of the NCC 2019

Note 1

All insulation products referenced in this report are nominal only and do not imply fitness for purpose beyond NCC Section J (Energy Efficiency) considerations. All insulation materials used in a Class 2 to 9 building must also comply with the relevant non-combustibility requirements and fire hazard properties of the National Construction Code (NCC) and associated standards and regulations. The fire hazard properties of all materials should be confirmed independently with an appropriately qualified fire engineering professional prior to specification

H.3 Thermal Comfort and Predicted Mean Vote (PMV)

Thermal Comfort as defined by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) is “the state of mind that expresses satisfaction with the surrounding environment”.

PMV is an index that predicts the mean value of the votes of a large group of persons on a seven-point thermal scale. PMV can be determined when the activity (metabolic rate) and the clothing (thermal resistance) are estimated together with the known environmental parameters including:

- Room air temperature
- Mean radiant temperature
- Relative air velocity and
- Relative humidity.

The ASHRAE thermal sensation scale is defined as follows:

+3 hot

+2 warm

+1 slightly warm

0 neutral

-1 slightly cool

-2 cool

-3 cold

The NCC 2019 JV3 verification method is a compliance pathway that can be used to demonstrate that thermal comfort levels of the proposed building achieve Predicted Mean Vote values between -1 and +1 across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building (occupancy of the building is greater than 20% of the peak occupancy).

The comfort setting parameters used for the PMV calculations are the following:

Clothing Values Used

- For Air-Conditioned Spaces (for determining the frequency of PMV > +1)
  - Clothing (CLO) = 0.6
- For Air-Conditioned Spaces (for determining the frequency of PMV < -1)
  - Clothing (CLO) = 1.0

Metabolic Rate Values Used

- Metabolic Rate (MET) = 60 W/m2 for (seated)
  (ASHRAE 55-2010 Table A1: Metabolic Rates for Typical Tasks)

Air Velocity Values Used

- Air Velocity = 0.15 m/s

Cooling Setpoint: 24oC

Heating Setpoint: 21oC

Operational hours: 8AM to 6PM (Daily) for Class 5 Office, 10AM to 12AM (Monday to Saturday) for Class 6 restaurant/ café as per HVAC occupancy profile shown in Specification JVc of the NCC 2019 Section J

H.4 Thermal Comfort - Predicted Mean Vote

The calculation of PMV distribution results has found:

- PMV can be maintained between -1.0 and 1.0 for minimum 98% of the occupied hours across 95% of the nominated area.
- The following table outlines the results to demonstrate that the Predicted Mean Vote (PMV) is maintained in the Range of -1.0 < PMV < 1.0 for minimum 98% of the occupied hours all the nominated area.
- For detailed space by space PMV results, refer to Appendix J.7

PMV Test Levels	**Percentage nominated area within range for 98% of occupied hours**	**Compliance (Yes/ No)**
-1<PMV<+1	100	Yes

H.5 Thermal Comfort (PMV) Results

Predicted Mean Vote								NCC 2019 Requirement
Space	Nominated floor area (m^2)	Predicted Mean Vote – Hours in Range						% Hours Compliant
		<-1.0	<-0.5	-0.5<PMV<0.5	>0.5	>1.0	Total	
Community space	151	0	393	3622	0	0	4015	100
HCA office	42	19	1299	1311	0	0	2610	100
HCA meeting room	11	33	1521	1089	0	0	2610	100
					Percentage of nominated area with a min 98% of hours within -1<PMV<+1 range			100

H.6 Building Model

Images of the IES VE model are shown below, with relevant surrounding structures.

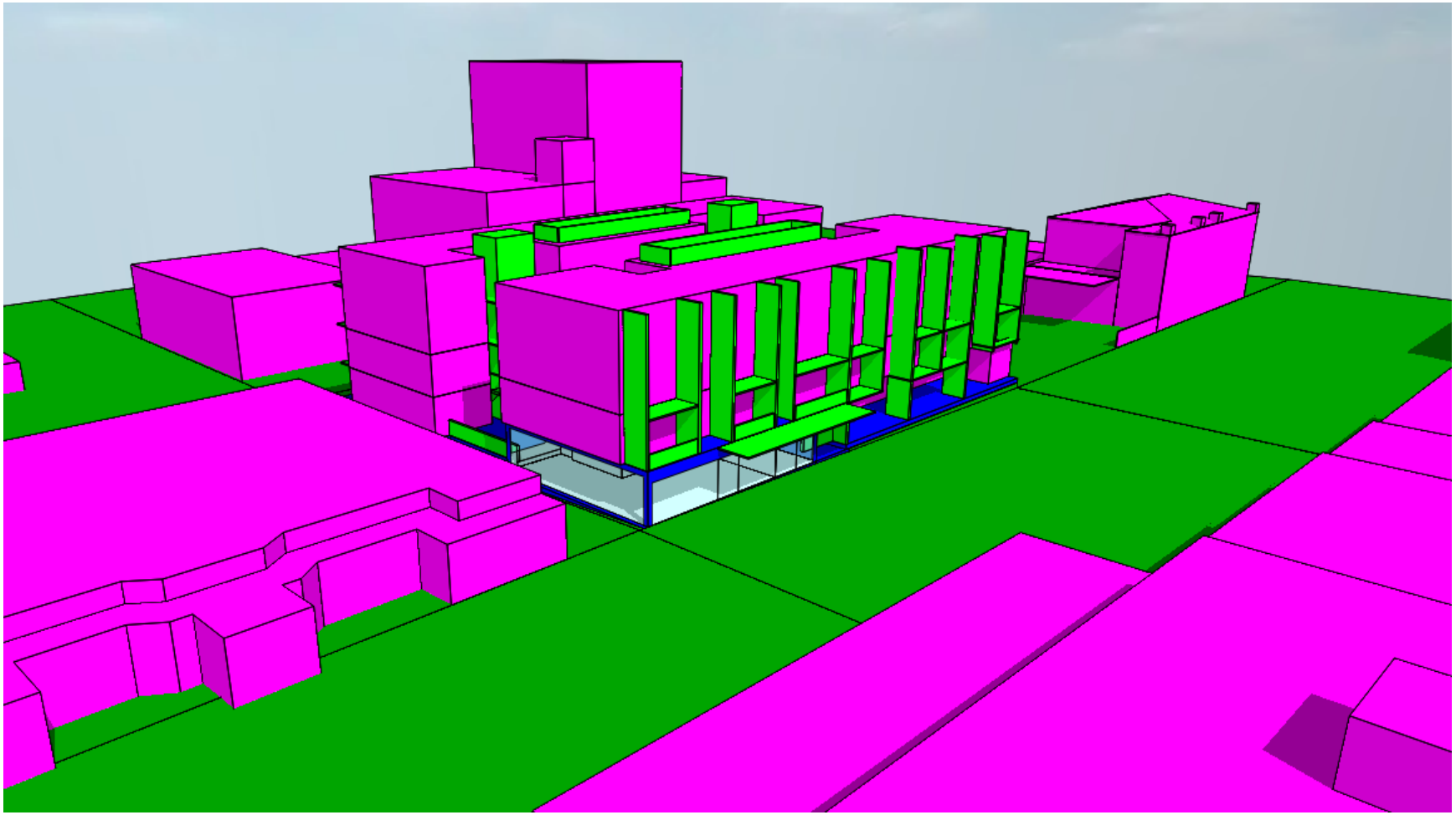


Figure 3 View from North-West of the IES VE model.

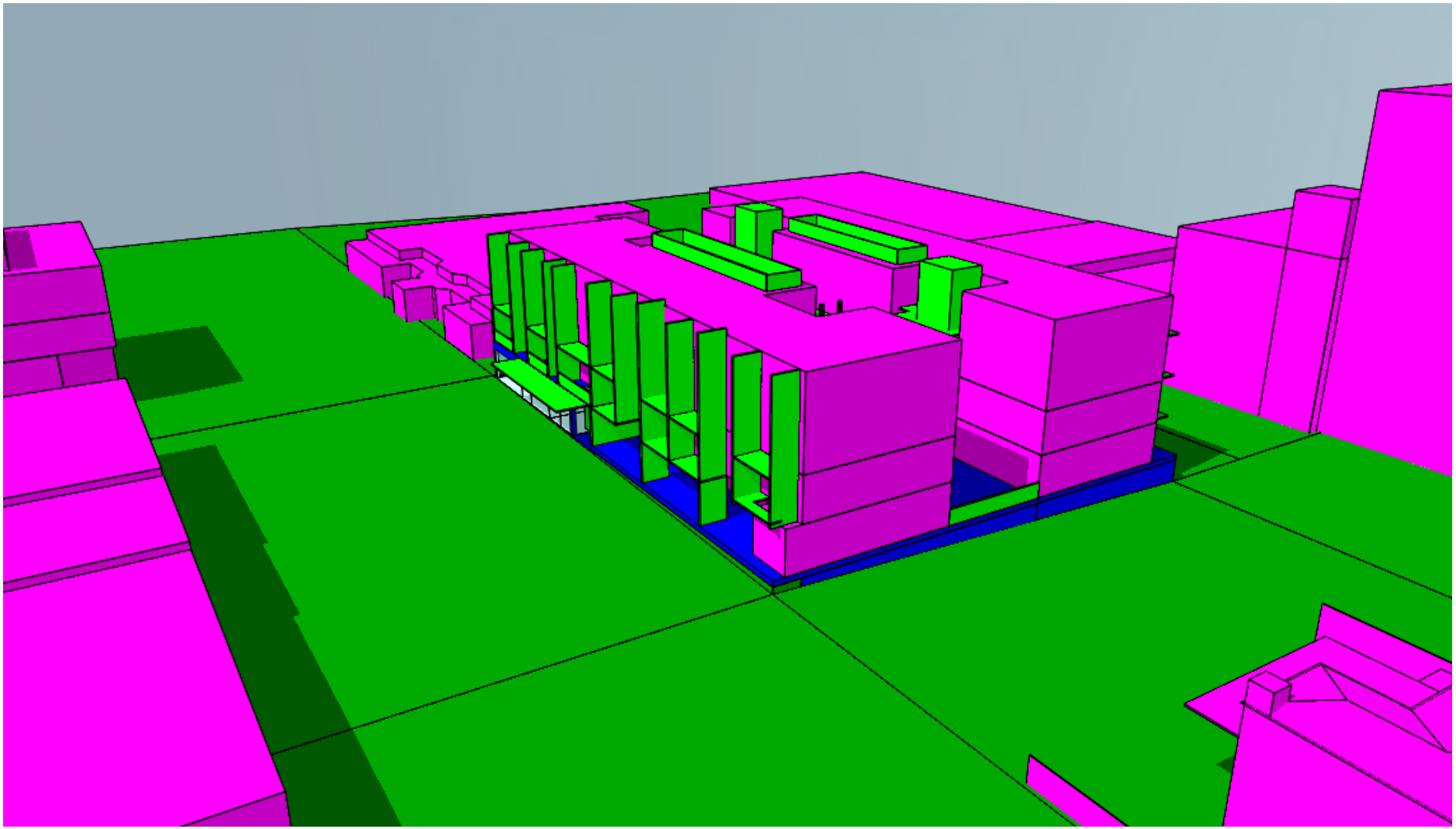


Figure 4 View from South-East of the IES VE model.

H.7 J1.5 Wall-Glazing Calculator

NCC 2019 Wall-Glazing Calculator v3.0

Wall and glazing energy efficiency in Class 2-9 buildings - Method 2 of Specification J1.5a, NCC 2019

Building name and description	Classification	Climate Zone
18 Mason St, Warragul (Community Space & HCA Office)	Other	6

Calculated Area-Weighted U-Value	1.98	Calculated Representative Air-Conditioning Energy Value	38.9
Allowable Area-Weighted U-Value	2.00	Allowable Representative Air-Conditioning Energy Value	38.9
Building total U-Value allowance met	**100%**	**Building total SHGC allowance met**	**100%**

Check Values	Wall Element Requirements	Display Glazing Element Requirements
Visible	Met	-

Use of this calculator does not guarantee compliance with the NCC. The disclaimer and a version update check are available at the bottom of the page.

Element Description					U-Value		SHGC and Shading				
ID	Description (optional)	Element Type	Facing Sector	Area (m^2)	U-Value	U-Value Element share of allowance used	SHGC	Glazing Height (m)	Shading Height (m)	Shading Projection (m)	SHGC Element share of allowance used
1		Wall	North	0.00	1.00	0% of building total					Not counted
2		Wall	East	31.90	1.00	9% of building total					Not counted
3		Wall	South	14.16	1.00	4% of building total					Not counted
4		Wall	West	6.36	1.00	2% of building total					Not counted
5		Wall	Internal	0.00	1.00	0% of building total					Not counted
6		Glazing	North	42.24	2.37	27% of building total	0.199	3.20	3.20	0.25	46% of building total
7		Glazing	West	16.38	2.37	11% of building total	0.199	2.80	0.00	0.00	14% of building total
8		Glazing	West	28.14	2.37	18% of building total	0.199	2.80	3.20	2.45	15% of building total
9		Glazing	South	28.08	2.37	18% of building total	0.199	2.40	3.20	7.90	11% of building total
10		Glazing	East	8.40	2.37	5% of building total	0.199	2.00	3.20	1.50	7% of building total
11		Glazing	East	4.48	2.37	3% of building total	0.199	2.80	3.20	1.50	3% of building total
12		Glazing	East	6.10	2.37	4% of building total	0.199	2.00	0.00	0.00	5% of building total

Disclaimer:

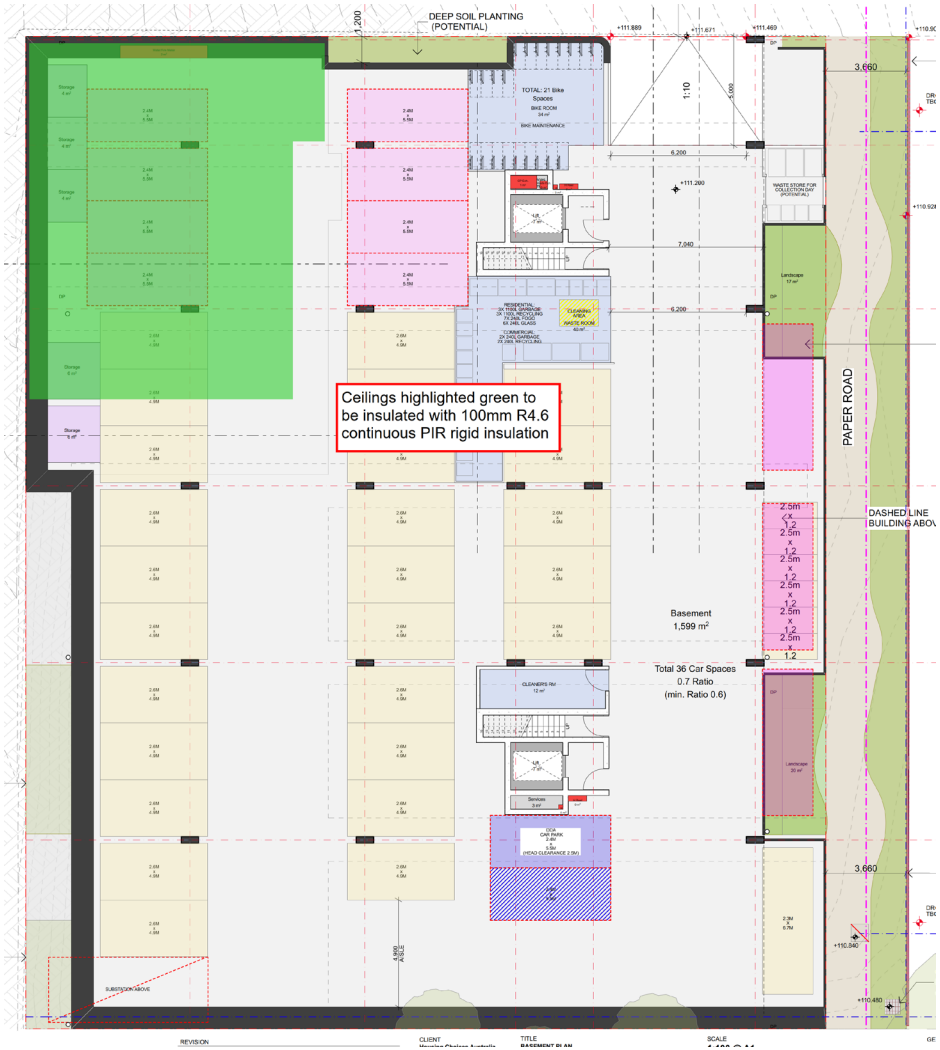
This calculator has been developed to assist in developing a better understanding of the glazing energy efficiency parameters of NCC 2019. While the author believes that the calculator, if used correctly, is likely to produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of this calculator is entirely at your own risk and the author accepts no liability of any kind.

Made by Alex Zeller

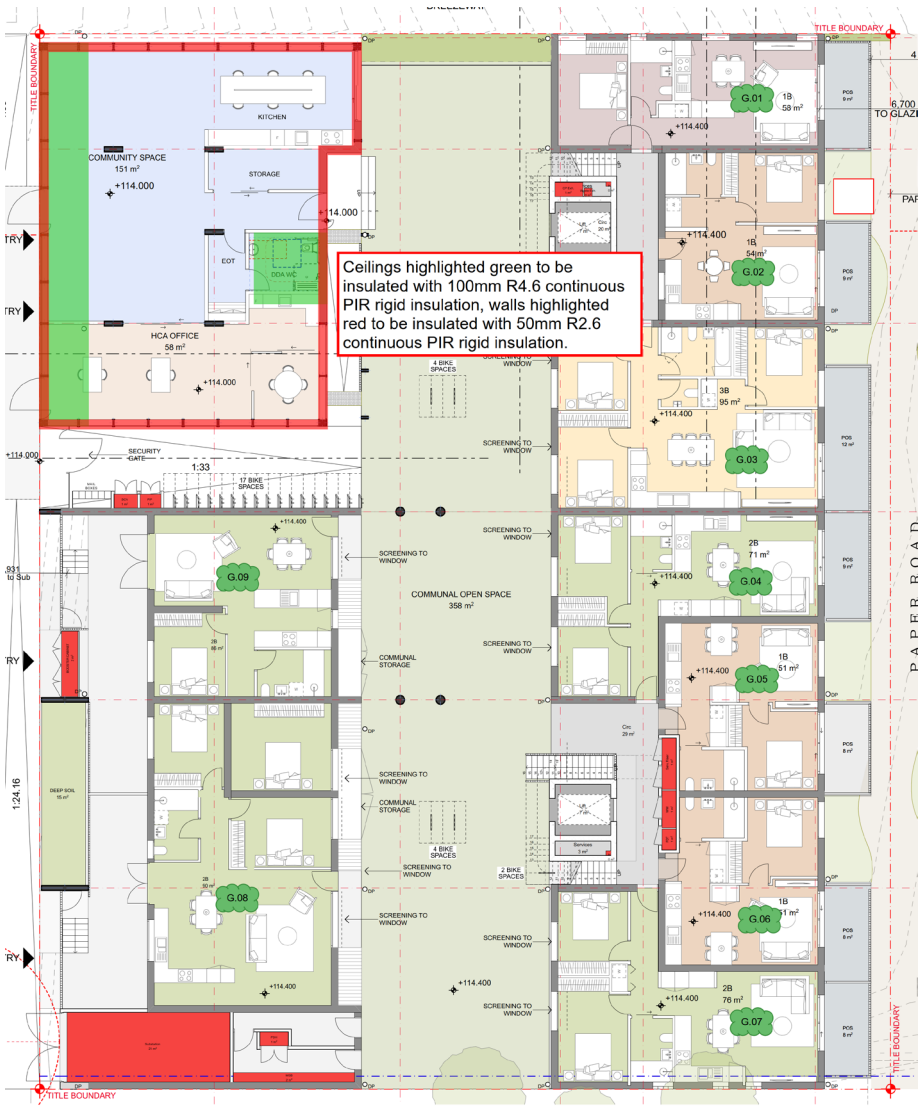
Email alex.wallglazingcalculator@gmail.com with any suggestions for improvement

Check for version update

H.8 Insulation Markups



Basement 1



Ground floor

H.9 Simulation Software

The building has been modelled using IES Virtual Environment software.

IES Virtual Environment complies with the ABCB 'Protocol for Building Energy Analysis Software for Class 3, 5, 6, 7, 8 and 9 Buildings' (Version 2006.1). Indeed, IES Virtual Environment:

- Is commercially available;
- Is based on a simulation program with hourly climate data file;
- Is capable of computing the annual energy consumption of a building in accordance with the verification methods of the NCC;
- Is capable of geometrically describing the building in three dimensions including taking into account the surface azimuth, tilt angle and adjacent structures and features; and
- Provides the results comparable to other similar software in accordance with ASHRAE Standard 140-2001.

IES Virtual Environment is an analysis software tested in accordance with ASHRAE Standard 140-2001 using the International Energy Agency BESTEST. IES Virtual Environment meets the following standards and can undertake the following methodologies:

- Standards: ASHRAE 140: 2001, 2004, 2007, 2014 / BEST TEST / CIBSE TM33 / European Union EN13791: July 2000 / EPACT Qualified / ANSI/ASHRAE/ACCA Standard 183;
- Methodologies: UK National Calculation methodology (NCM) / ASHRAE 55 calculation procedure / ASHRAE 90.1 Appendix G PRM calculation procedure / ASHRAE 62.1 calculation procedure / ISO 7730 calculation procedure.

For more information about IES Virtual Environment ANSI/ASHRAE Standard 140-2001 accreditation, please refer to the following webpage:
https://www.iesve.com/software/software-validation

H.10 Performance Based Design Brief

The following information is provided in accordance with the requirements of NCC 2019 Volume One, Amendment 1.

A2.2 Performance Solution

- The proposed building comprises:
  - Class 5 – Office
  - Class 9b – Assembly Building
- Location: 18 Mason Street Warragul
- Applicable Performance Requirement: NCC 2019 Section J1, J2, J3
- Analytical Assessment Process: JV3 Verification in accordance with Section J0 (Energy Efficiency) and Section J1 (Building Fabric) of the NCC 2019 (Volume One).
- Acceptance Criteria: annual Greenhouse Gas Emissions lower than Deemed-to-Satisfy Reference case.
- Scope of Supporting Evidence: JV3 Verification method parameters and modelling outputs
- Format and Content of report: JV3 Verification method simulation report.
- Participants:
  - JV3 Verification: The energy modelling was undertaken by Broderick Jacobs, ESD Consultant, Ark Resources. Broderick has graduated from RMIT and holds a bachelor's degree in Sustainable Systems Engineering (Honours). Broderick is a Design Matters accredited thermal performance assessor and holds a Certificate IV in Home Energy Efficiency and Sustainability. Broderick is a sustainable building specialist with experience in building simulation such as energy modelling, daylight modelling, shading analysis, thermal comfort analysis, energy simulation and thermal simulation of building façades.
  - Architect: Freadman White
  - Client: Housing Choice Australia

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