

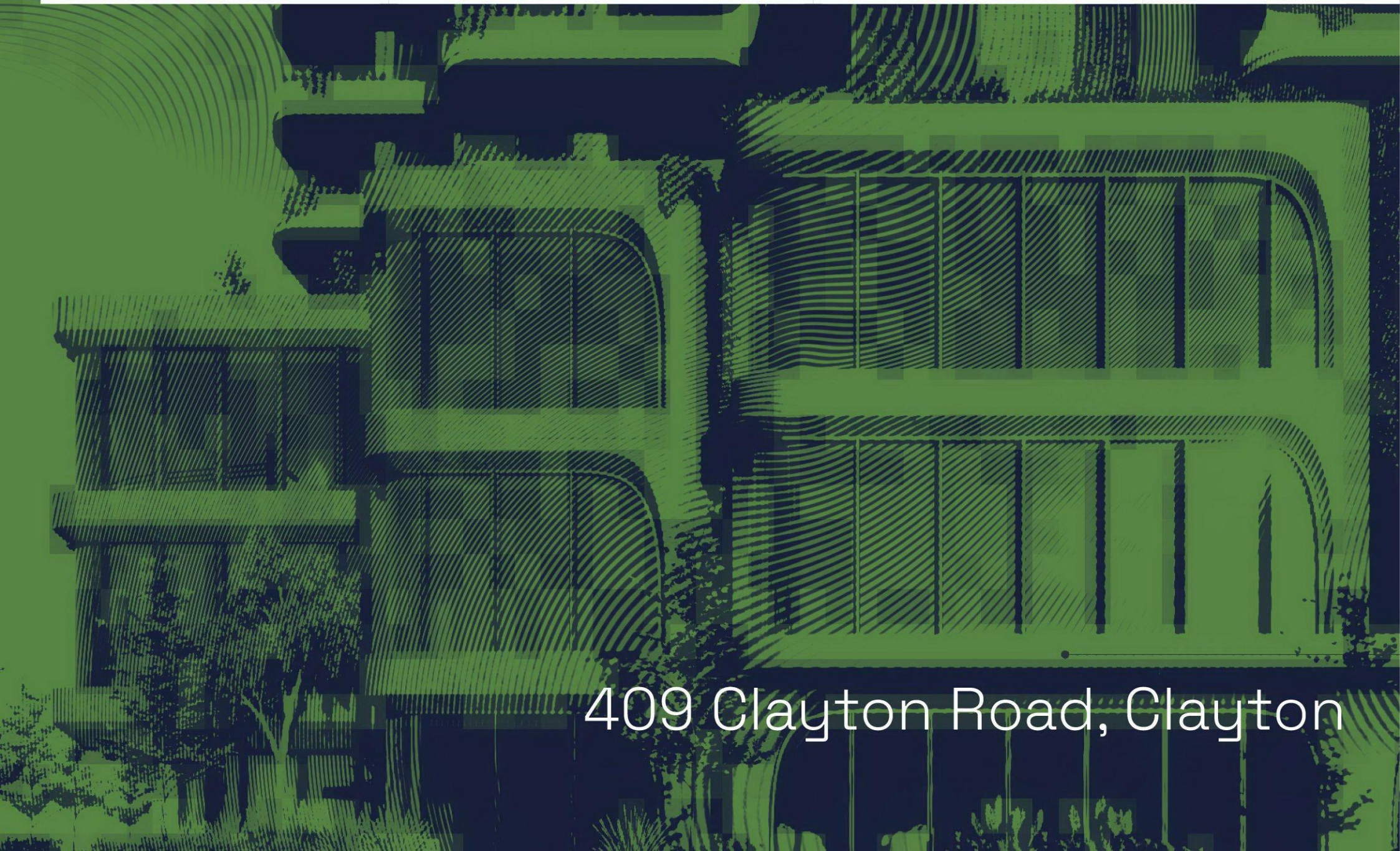
**ADVERTISED COPY**

11.08.2023  
File No. 1493A

Sustainable Management Plan

409 Clayton Road, Clayton

Ark Resources



409 Clayton Road, Clayton

© Ark Resources 2023

The information contained in this document that has been produced by Ark Resources Pty Ltd is solely for the use of Ark Resources' Client for the purpose for which it has been prepared and Ark Resources undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

All material contained in this report is subject to Australian copyright law. Copyright in the document is owned by Ark Resources Pty Ltd. No material from this document may, in any form or by any means, be reproduced, stored in a retrieval system or transmitted, without prior written permission from Ark Resources.

Any enquiries regarding the use of this report should be directed to:

Ark Resources Pty Ltd  
 ABN 29 086 461 369  
 Suite 8, 10 Northumberland Street  
 South Melbourne VIC 3205 Australia  
 +61 3 9636 0280  
[info@arkresources.com.au](mailto:info@arkresources.com.au)  
[arkresources.com.au](http://arkresources.com.au)

Issue	Date	Prepared	Checked	Status
A	24.06.2020	LD/MT/HM		Draft
B	07.07.2020	LD/MT/HM		Final
C	21.07.2020	LD/MT/HM		Final
D	25.11.2020	MR		Draft
E	27.11.2020	MR		TP Issue
F	03.08.2023	FP/DO/DC	LD	TP Draft
G	11.08.2023	FP/DO/DC	LD	TP

## Contents

1.0	Introduction	3
2.0	Site Description	5
3.0	Key ESD Initiatives	7
4.0	MUSIC Modelling	8
5.0	Daylight	9
6.0	NatHERS Energy Ratings	10
7.0	Green Star Building	11
8.0	Conclusion	13

## Appendices

Appendix A.	Green Star Building Pathway	14
Appendix B.	MUSIC Modelling	25
Appendix C.	NatHERS Energy Rating Assumptions	29
Appendix D.	WSUD Maintenance Manual	35
Appendix E.	Solar Photovoltaics	37
Appendix F.	Site Management Plan	39
Appendix G.	Daylight Modelling	40

## 1.0 Introduction

---

Ark Resources has been engaged by 409 Clayton Group Trust to provide advice in relation to environmentally sustainable development outcomes from the proposed development at 409 Clayton Road, Clayton.

The proposed mixed-use development at 409 Clayton Road has been designed to meet Clauses 15.01-2S, 22.13 and 53.18 (Building Design, ESD and WSUD Policies) of the Monash Planning Scheme. This report demonstrates how the development meets policy objectives of the Planning Scheme.

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 Murray Fletcher, Tango Projects.

Architectural drawings prepared by Cera Stribley  
Architects set out below.

BASEMENT 1 PLAN	TP.1090		
GROUND FLOOR PLAN	TP.1100		
LEVEL 01 PLAN	TP.1101		
LEVEL 01 MEZZANINE PLAN	TP.1101		
LEVEL 02 PLAN	TP.1101		
LEVEL 03 PLAN	TP.1102		
LEVEL 04-10 PLAN	TP.1103		
LEVEL 11 PLAN	TP.1104		
LEVEL 12 PLAN	TP.1105		
LEVEL 13 PLAN	TP.1106		
LEVEL 14 PLAN	TP.1107		
LEVEL 15 PLAN	TP.1109		
LEVEL 16 PLAN	TP.1110		
CLAYTON ROAD STREETSCAPE ELEVATION	TP.2000		
CENTRE ROAD STREETSCAPE ELEVATION	TP.2001		
EAST/NORTH ELEVATION	TP.2101		
WEST/SOUTH ELEVATION	TP.2102		
BUILDING SECTION A-A	TP.3000		
BUILDING SECTION B-B	TP.3001		
TPOLOGY PLAN 01	TP.5001		
TPOLOGY PLAN 02	TP.5002		
TPOLOGY PLAN 03	TP.5003		
TPOLOGY PLAN 04	TP.5004		
TPOLOGY PLAN 05	TP.5005		
TPOLOGY PLAN 06	TP.5006		

TPOLOGY PLAN 07	TP.5007		
TPOLOGY PLAN 08	TP.5008		
TPOLOGY PLAN 09	TP.5009		
TPOLOGY PLAN 10	TP.5010		
TPOLOGY PLAN 11	TP.5011		
TPOLOGY PLAN 12	TP.5012		
TPOLOGY PLAN 13	TP.5013		
TPOLOGY PLAN 14	TP.5014		
TPOLOGY PLAN 15	TP.5015		
SHADOW STUDY - 09AM/10AM	TP.8000		
SHADOW STUDY - 11AM/12PM	TP.8001		
SHADOW STUDY - 1PM/2PM	TP.8002		
SHADOW STUDY - 3PM	TP.8003		
DEVELOPMENT SUMMARY			

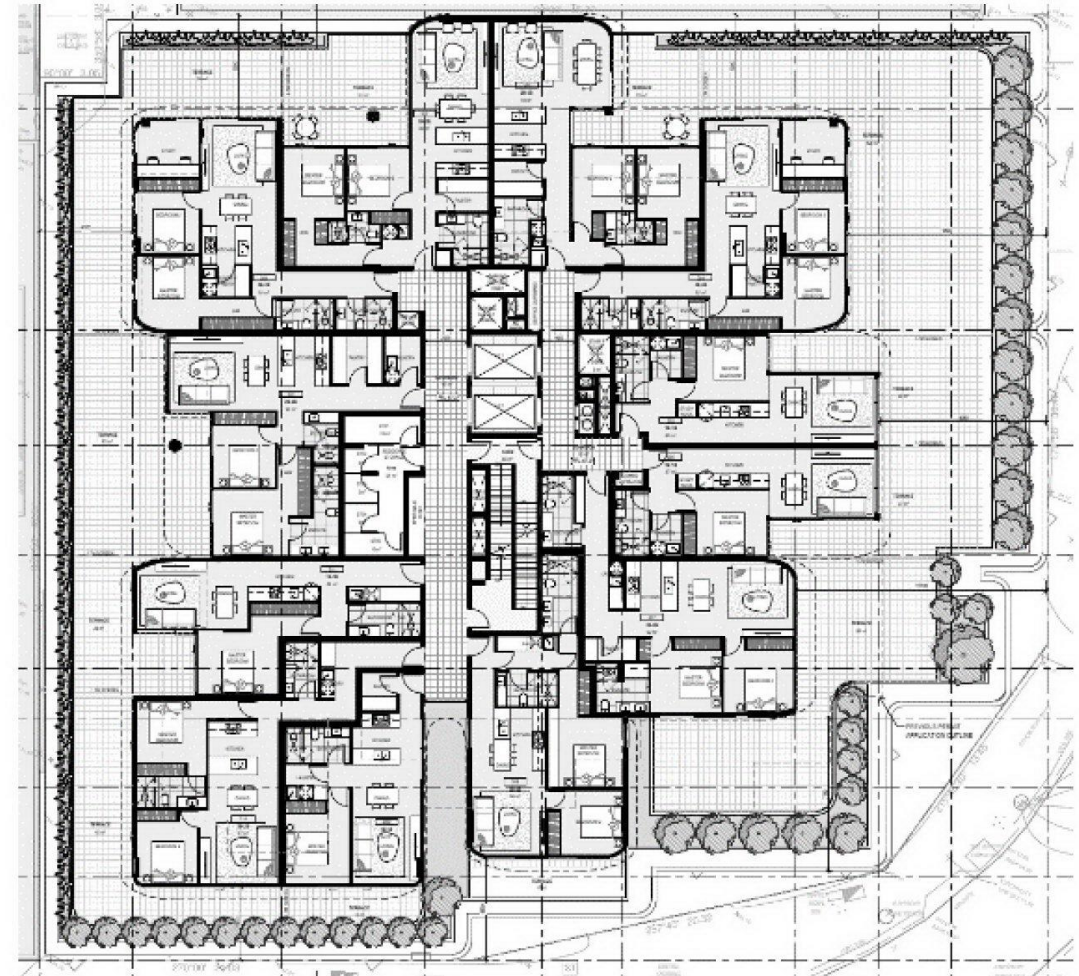
## 2.0 Site Description

The building comprises the following uses:

- Office/Retail tenancies with a total NLA of approximately 2,347m<sup>2</sup>; and
- 144 apartments, with 247 bedrooms across 13 levels
- Located within the Monash City Council
- Site area 2,099m<sup>2</sup> (approximately)
- Surrounds mix of residential and commercial uses

A plan of the proposed development is provided below (Level 03)

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




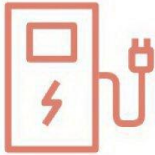





### 3.0 Key ESD Initiatives

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:

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:

<p><b>Energy</b> Commitment to 100% Green Power</p> 	<p><b>Transport</b> Electric vehicle chargers and infrastructure</p> 	<p><b>Green Star Buildings</b> The development achieve a 4 Star Green Star Buildings performance standard</p> <p><b>4 star</b></p>	<p><b>NatHERS Energy Ratings</b> The project will achieve a development average of 7 stars</p> <p><b>7.0 star</b></p>
<p><b>Water</b> Rainwater harvesting system for toilet flushing</p> 	<p><b>Performance</b> High-performance glazing and energy efficient building services, appliances and fixtures</p> 	<p><b>Stormwater</b> The development meets the Best Practice standard for stormwater quality.</p> 	

## 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:	Reduction in Total Phosphorus (TP) load:
<b>92.0</b>	<b>68.5</b>
Reduction in Total Nitrogen (TN) load:	Reduction in Gross Pollutants (GP) load:
<b>59.7</b>	<b>99.5</b>

The results indicate that the project meets the Credit Achievement requirements of Green Star Buildings Credit 39 Waterway Protection.

Refer to Appendix B for the MUSIC rating results, Appendix B.4 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 Level 3 to Level 16 terrace areas (approx. 1,411m<sup>2</sup>):
- Filtration and treatment of all rainwater prior to draining into the tank
- Total storage volume of 60kL rainwater tanks
- Re-use of captured water for flushing of all Office toilets on Levels 1 & 2, plus residential toilets on Levels 3, 4 & 5

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:

A SPEL Vortceptor 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 Daylight

An analysis of internal daylight levels in bedrooms and living/ kitchen areas of Level 3 & 4 have been undertaken to demonstrate that internal daylight levels have been achieved in accordance with the council's best practice design standards. The model accounts for shading and obstructions provided by adjacent and equitable structures.

### 5.1 Summary of Results

Area Type	Rooms meeting 'best practice'	% of rooms meeting 'best practice'
Kitchen/ Living Areas	120	83%
Bedrooms	241	98%

Table 1: Extrapolated Results for Living/Kitchen Areas and Bedrooms

### 5.2 Daylight Benchmark

The BESS tool is nominated as a reference document in the Council's Environmentally Sustainable Development Policy and sets the following performance standards for internal daylight within habitable rooms of residential developments.

- At least 80% of dwellings achieve a daylight factor greater than 1% to 90% of the floor area of each living area, including kitchens.
- At least 80% of dwellings achieve a daylight factor greater than 0.5% to 90% of the floor area in all bedrooms.

Accordingly, these benchmarks are adopted as the basis for this assessment of internal daylight levels within the proposed development.

## 6.0 NatHERS Energy Ratings

---

FirstRate5 (Version 5.3.1a (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.

---

### NatHERS Rating

The project will achieve a development average of

# 7.0 star

---

Heating Load Average

# 71.2 MJ/m<sup>2</sup>

---

Cooling Load Average

# 15.9 MJ/m<sup>2</sup>

---

### Class 2 Climate Zone 62

The results of the modelling confirm that:

- 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;
- All individual apartments have cooling loads of less than 21 MJ/m<sup>2</sup> 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 62 Moorabbin);
- The average heating load of 71.2 MJ/m<sup>2</sup> and the cooling load of 15.9 MJ/m<sup>2</sup> are significantly less than the relevant threshold loads set out in NCC 2019 for Class 2 dwellings (average heating load <109 MJ/m<sup>2</sup>, average cooling load <26 MJ/m<sup>2</sup>), 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 <147 MJ/m<sup>2</sup>, cooling load <37 MJ/m<sup>2</sup>).

Please refer to Appendix C 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

# 26 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 standard however certification of the rating with the Green Building Council will not be undertaken. A points margin of 20% 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.

<b>Credit</b>	<b>Target</b>	<b>Points</b>	
1	Industry Development	Credit Achievement	1
2	Responsible Construction	Credit Achievement	1
3	Verification and Handover	Minimum Expectation	
4	Operational Waste	Minimum Expectation	
5	Responsible Procurement		
6	Responsible Structure		
7	Responsible Envelope		
8	Responsible Systems		
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	Minimum Expectation	
14	Amenity and Comfort		
15	Connection to Nature	Credit Achievement	1
16	Climate Change Resilience	Credit Achievement	1
17	Operations Resilience	Credit Achievement	2
18	Community Resilience		
19	Heat Resilience	Credit Achievement	1
20	Grid Resilience		
21	Upfront Carbon Emissions	Minimum Expectation	
22	Energy Use	Credit Achievement	3
23	Energy Source	Exceptional Performance	6
24	Other Carbon Emissions		
25	Water Use	Minimum Expectation	

26	Life Cycle Impacts		
27	Movement and Place	Credit Achievement	3
28	Enjoyable Places		
29	Contribution to Place		
30	Culture, Heritage and Identity		
31	Inclusive Construction Practices	Minimum Expectation	
32	Indigenous Inclusion		
33	Procurement and Workforce Inclusion		
34	Design for Inclusion		
35	Impacts to Nature	Credit Achievement	2
36	Biodiversity Enhancement	Credit Achievement	2
37	Nature Connectivity		
38	Nature Stewardship		
39	Waterway Protection	Credit Achievement	2
40	Market Transformation		
41	Leadership Challenges		

Refer to Appendix A for details of credit requirements

## 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 1 point for the potable water calculator (equivalent to the Green Star Multi Retail Wat-1 credit); 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 15.01-2S, 22.13 and 53.18 (Building Design, ESD and WSUD Policies) of the Monash Planning Scheme. This report demonstrates how the development meets policy objectives of the Planning Scheme..

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 5 star Green Star Buildings

---

### Green Star

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

# 4 star

---

### Potable Water Reduction

Using the Green Star Multi Retail WAT-1 credit the redevelopment will achieve:

# 8 pts

---

### 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
<p><b>1 Industry Development</b></p> <p>The development facilitates industry transformation through partnership, collaboration, and data sharing</p>	<p>The building owner or developer appoints a Green Star Accredited Professional (GSAP).</p> <p>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.</p> <p>The building owner or developer markets the building's sustainability achievements. The project team must:</p> <ul style="list-style-type: none"> <li>– 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</li> <li>– Detail how the building will detail its sustainability achievements to its stakeholders. The stakeholders are defined as the typical building occupants and visitors.</li> </ul> <p>The building owner or developer appoints a Green Star Accredited Professional (GSAP).</p>	<b>1</b>	<p>Strategy Brief Concept Design Tender Construction Handover Use</p>
<p><b>2 Responsible Construction</b></p> <p>The builder's construction practices reduce impacts and promote opportunities for improved environmental and social outcomes</p>	<p>The builder must have an environmental management system (large builders will need to be ISO14001 accredited).</p> <p>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.</p> <p>80% of Construction and demolition waste must be recycled.</p> <p>The builder must have an environmental management system (large builders will need to be ISO14001 accredited).</p> <p>Sustainability training is provided to construction workers. The head contractor must provide the following training:</p> <ul style="list-style-type: none"> <li>– Information on the sustainable building certification(s) sought, including:</li> </ul>	MINIMUM EXPECTATION	<p>Tender Construction</p>

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	<ul style="list-style-type: none"> <li>the sustainability attributes of the building and their benefits</li> <li>the value of certification</li> <li>the role site worker(s) play in delivering a sustainable building</li> </ul>		
	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	
<p><b>3 Verification and Handover</b></p> <p>The building has been optimised and handed over to deliver a high level of performance in operation</p>	<p>The building is set up for optimum ongoing management due to its appropriate metering and monitoring systems.</p> <p>The building must have accessible energy and water metering for all common uses, major uses, and major sources.</p> <p>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.</p> <hr/> <p>The building has set environmental performance targets, designed and tested for airtightness, been commissioned, and will be tuned.</p> <p>The project team must perform the following:</p> <ul style="list-style-type: none"> <li>Prior to construction:                             <ul style="list-style-type: none"> <li>Set environmental performance targets</li> <li>Perform a services and maintainability review</li> <li>Design for airtightness</li> </ul> </li> <li>During construction and practical completion:                             <ul style="list-style-type: none"> <li>Commission the building</li> <li>Engage building tuning service provider</li> <li>Test for airtightness</li> </ul> </li> <li>After practical completion:                             <ul style="list-style-type: none"> <li>Tune the building over the next 12 months</li> </ul> </li> </ul> <hr/> <p>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.</p> <p>The project team must provide operations and maintenance information for all nominated building systems to the building owner (or designated representative). This means:</p> <ul style="list-style-type: none"> <li>Appropriate content for all nominated building systems has been developed and provided</li> <li>The appropriate user group has access to the information they require to deliver best practice environmental outcomes</li> </ul>	MINIMUM EXPECTATION	<p>Design</p> <p>Tender</p> <p>Construction</p> <p>Handover</p> <p>Use</p>

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	<ul style="list-style-type: none"> <li>– Guidance on keeping information up to date is provided to the facilities management team in these documents</li> </ul>		
<p><b>4 Operational Waste</b></p> <p>Operational waste can be separated and recovered in a safe and efficient manner</p> <p>The building must have appropriate spaces for waste management and an appropriately sized loading dock</p>	<p>The building is designed for the collection of separate waste streams.</p> <p>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:</p> <ul style="list-style-type: none"> <li>– General waste going to landfill</li> <li>– Recycling streams to be collected by the building’s waste collection service, including: <ul style="list-style-type: none"> <li>· paper and cardboard</li> <li>· glass</li> <li>· plastic</li> </ul> </li> <li>– One additional waste stream identified by the project team. This may include collecting any of the following waste types: <ul style="list-style-type: none"> <li>· organics, e-waste, batteries etc.</li> </ul> </li> </ul> <p>The building provides a dedicated and adequately sized waste storage area.</p> <p>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.</p> <p>The building ensures safe and efficient access to waste storage areas for both occupants and waste collection contractors.</p> <p>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.</p>	MINIMUM EXPECTATION	Design Handover Use
<p><b>9 Responsible Finishes</b></p> <p>The building’s internal finishes are comprised of responsibly manufactured products</p>	<p>40% of all internal building finishes (by cost) meet a Responsible Products Value of at least 7.</p> <p>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.</p> <p>Loose furniture is not included.</p>	1	Design Tender Construction
<p><b>10 Clean Air</b></p> <p>Pollutants entering the building are minimised, and a high level of fresh air is provided to</p>	<p>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.</p> <p>All new and existing ductwork that serves the building must be cleaned prior to occupation in accordance with a recognised Standard.</p>	MINIMUM EXPECTATION	Design Tender Construction Handover



Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
ensure levels of indoor pollutants are maintained at acceptable levels	<p>The building must be provided with at an adequate amount of outside air.</p> <p>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:</p> <p>Where ventilation is by mechanical means, the building must provide outdoor air as per AS1668.2:2012 for the default occupancy.</p> <p>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.</p> <hr/> <p>Point source pollutants must be exhausted directly outside (printers, kitchens).</p>		Use

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
<p><b>11 Light Quality</b></p> <p>The building provides good daylight and its lighting is of high quality</p>	<p>Lighting within the building meets minimum comfort requirements.</p> <p>Lighting within the building must meet the following requirements:</p> <ul style="list-style-type: none"> <li>- All LED lighting installed has no observable effect as per the standard IEEE 1789-2015</li> <li>- Light sources must have a minimum Colour Rendering Index (CRI) 85 or higher</li> <li>- 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</li> <li>- 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</li> <li>- All light sources must have a maximum of 3 MacAdam Ellipses deviation.</li> </ul> <p>Good lighting levels suitable for the typical tasks in each space are available.</p> <p>The building provides adequate levels of daylight.</p> <ul style="list-style-type: none"> <li>- Ensures regularly occupied areas are in reasonable proximity to glazed façades, windows, or skylights</li> <li>- Maximises daylight to spaces that prioritise learning, healing, and living: <ul style="list-style-type: none"> <li>· For apartments, how in 95% of all apartments, the living rooms and all bedrooms have access to a view and daylight.</li> </ul> </li> </ul>	MINIMUM EXPECTATION	<p>Concept</p> <p>Design</p> <p>Tender</p>
<p><b>12 Acoustic Comfort</b></p> <p>The building provides acoustic comfort for building occupants</p>	<p>Internal noise levels from services and the outside is limited through an acoustic comfort strategy.</p> <p>The Acoustic Comfort Strategy is to include:</p> <ul style="list-style-type: none"> <li>- A summary of the Standards, legislation, guidelines, and other requirements that apply to the project</li> <li>- 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</li> <li>- Description of how the design solution is intended to achieve the proposed performance metrics</li> </ul>	MINIMUM EXPECTATION	<p>Design</p> <p>Tender</p> <p>Construction</p> <p>Handover</p>

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage																														
<p><b>13 Exposure to Toxins</b></p> <p>The building’s occupants are not directly exposed to toxins in the spaces they spend time in</p>	<p>The building’s paints adhesives, sealants, and carpets are low in TVOC or non-toxic.</p> <p>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.</p> <p><b>Paints, Adhesives and Sealants</b></p> <table border="1" data-bbox="488 363 1160 933"> <thead> <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> </thead> <tbody> <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> </tbody> </table> <p><b>Carpets</b></p> <table border="1" data-bbox="488 973 1422 1284"> <thead> <tr> <th>Compliance option</th> <th>Test protocol</th> <th>Limit</th> </tr> </thead> <tbody> <tr> <td rowspan="2">ASTM D5116</td> <td>ASTM D5116 - Total VOC limit*</td> <td>limit* 0.5mg/m<sup>2</sup> per hour</td> </tr> <tr> <td>ASTM D5116 - 4-PC (4-Phenylcyclohexene) *</td> <td>0.05mg/m<sup>2</sup> 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/m<sup>2</sup> 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/m<sup>2</sup> per hour</td> </tr> </tbody> </table> <p>The building’s engineered wood products are low in TVOC or non-toxic.</p> <p>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:</p>	Product category	Max. Total Volatile Organic Compounds (TVOC) content in grams per litre (g/L) of ready to use product	General purpose adhesives and sealants	50	Interior wall and ceiling paint, all sheen levels	16	Trim, varnishes, and wood stains	75	Primers, sealers, and prep coats	65	One and two pack performance coatings for floors	140	Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250	Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100	Compliance option	Test protocol	Limit	ASTM D5116	ASTM D5116 - Total VOC limit*	limit* 0.5mg/m <sup>2</sup> per hour	ASTM D5116 - 4-PC (4-Phenylcyclohexene) *	0.05mg/m <sup>2</sup> per hour	ISO 16000 / EN 13419	ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m <sup>2</sup> per hour	ISO 10580 / ISO/TC 219 (Document N238)	ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5mg/m <sup>2</sup> per hour	<p>MINIMUM EXPECTATION</p>	<p>Design Tender Construction Handover</p>
Product category	Max. Total Volatile Organic Compounds (TVOC) content in grams per litre (g/L) of ready to use product																																
General purpose adhesives and sealants	50																																
Interior wall and ceiling paint, all sheen levels	16																																
Trim, varnishes, and wood stains	75																																
Primers, sealers, and prep coats	65																																
One and two pack performance coatings for floors	140																																
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250																																
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100																																
Compliance option	Test protocol	Limit																															
ASTM D5116	ASTM D5116 - Total VOC limit*	limit* 0.5mg/m <sup>2</sup> per hour																															
	ASTM D5116 - 4-PC (4-Phenylcyclohexene) *	0.05mg/m <sup>2</sup> per hour																															
ISO 16000 / EN 13419	ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m <sup>2</sup> per hour																															
ISO 10580 / ISO/TC 219 (Document N238)	ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5mg/m <sup>2</sup> per hour																															

Test protocol	Emissions Limit / Unit of Measurement
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m <sup>2</sup> hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m <sup>2</sup> hr (at 3 days)

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage																		
	<table border="1"> <thead> <tr> <th data-bbox="488 225 904 268">Test protocol</th> <th data-bbox="904 225 1807 268">Emissions Limit / Unit of Measurement</th> </tr> </thead> <tbody> <tr> <td data-bbox="488 276 904 323">AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood</td> <td data-bbox="904 276 1807 323">≤1mg/L</td> </tr> <tr> <td data-bbox="488 331 904 379">AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16</td> <td data-bbox="904 331 1807 379">≤1.5 mg/L</td> </tr> <tr> <td data-bbox="488 387 904 435">AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16</td> <td data-bbox="904 387 1807 435">≤1mg/L</td> </tr> <tr> <td data-bbox="488 443 904 467">AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)</td> <td data-bbox="904 443 1807 467">≤1mg/L</td> </tr> <tr> <td data-bbox="488 475 904 523">Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL</td> <td data-bbox="904 475 1807 523">≤1mg/L</td> </tr> <tr> <td data-bbox="488 531 904 579">JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460</td> <td data-bbox="904 531 1807 579">≤1mg/L</td> </tr> <tr> <td data-bbox="488 587 904 635">JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460</td> <td data-bbox="904 587 1807 635">≤1mg/L</td> </tr> <tr> <td data-bbox="488 643 904 691">JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)</td> <td data-bbox="904 643 1807 691">≤0.1 mg/m<sup>3</sup>hr*</td> </tr> </tbody> </table> <p data-bbox="488 699 1807 802">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.</p>	Test protocol	Emissions Limit / Unit of Measurement	AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/L	AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L	AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/L	AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/L	Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/L	JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/L	JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/L	JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m <sup>3</sup> hr*		
Test protocol	Emissions Limit / Unit of Measurement																				
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/L																				
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L																				
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/L																				
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/L																				
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/L																				
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/L																				
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/L																				
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m <sup>3</sup> hr*																				
<p data-bbox="85 826 430 850"><b>15 Connection to Nature</b></p> <p data-bbox="85 874 461 962">The building fosters connection to nature for building occupants</p>	<p data-bbox="488 818 1807 874">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.</p> <p data-bbox="488 922 1807 978">Indoor plants must be provided in regularly occupied areas. One or more plants in pots with a soil surface area totalling at least 500cm<sup>2</sup> for every 15m<sup>2</sup> of the regularly occupied spaces is required.</p> <p data-bbox="488 994 1807 1050">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.</p> <p data-bbox="488 1066 1807 1090">or</p> <p data-bbox="488 1106 1807 1161">Occupants can interact with nature either inside the building, or externally through a green façade (or wall) or garden.</p> <p data-bbox="488 1169 1807 1225">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).</p>	1	Brief Concept Design Tender Handover Use																		
<p data-bbox="85 1273 340 1329"><b>16 Climate Change Resilience</b></p> <p data-bbox="85 1353 439 1409">The building has been built to respond to the direct and</p>	<p data-bbox="488 1265 1807 1321">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</p>	MINIMUM EXPECTATION	Strategy Brief Concept Design																		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
indirect impacts of climate change	Climate Change Risk & Adaptation assessment prepared during early stage aligned with AS5334 under RCP 8.5 for 2050 & 2080.	1	
<p><b>17 Operations Resilience</b></p> <p>The building can respond to acute shocks and chronic stresses that can affect its operations over time</p>	<p>The project team undertakes a comprehensive risk assessment of the acute shocks and chronic stresses likely to influence future building operations, including:</p> <ul style="list-style-type: none"> <li>- Failure of critical infrastructure (power, water and digital)</li> <li>- Health pandemic</li> <li>- Water security</li> <li>- Geological hazards (landslides, earthquakes, tsunamis)</li> <li>- Direct attack (cyber and physical)</li> <li>- Ageing infrastructure</li> <li>- Rising cyber dependency</li> <li>- Increasing energy costs</li> <li>- Lack of transport accessibility and availability</li> </ul> <p>The building's design and future operational plan addresses any high or extreme system-level interdependency risks.</p> <p>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.</p>	2	Strategy Brief Concept Design
<p><b>19 Heat Resilience</b></p> <p>The building reduces its impact on heat island effect</p>	<p>At least 75% of the whole site area comprises of one or a combination of strategies that reduce the heat island effect.</p> <p>The strategies that can be used to reduce the heat island are:</p> <ul style="list-style-type: none"> <li>Vegetation</li> <li>- Green roofs</li> <li>- Roofing materials, including shading structures, having the following: <ul style="list-style-type: none"> <li>· For roof pitched &lt;15°- a three-year SRI of minimum 64</li> <li>· For roof pitched &gt;15°- a three-year SRI of minimum 34</li> </ul> </li> <li>- Unshaded hard-scaping elements with a three-year SRI of minimum 34 or an initial SRI of minimum 39</li> <li>- Hardscaping elements shaded by overhanging vegetation</li> </ul>	1	Design Tender Construction

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
<p><b>21 Upfront Carbon Emissions</b></p> <p>The building’s upfront carbon emissions from materials and products have been reduced and offset</p>	<p>The building’s upfront carbon emissions are at least 10% less than those of a reference building, calculated using the Upfront Carbon Emissions calculator.</p>	<p>MINIMUM EXPECTATION</p>	<p>Strategy Brief Concept Design</p>
<p><b>22 Energy Use</b></p> <p>(Reference Pathway)</p> <p>The building has low energy consumption</p>	<p>The building has at least a 10% lower energy consumption than one built to the National Construction Code 2019.</p>	<p>MINIMUM EXPECTATION</p>	<p>Brief Concept Design Tender</p>
<p><b>23 Energy Source</b></p> <p>The building’s energy comes from renewables</p>	<p>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.</p>	<p>MINIMUM EXPECTATION</p>	<p>Brief Concept Design Tender</p>
	<p>100% of the building’s energy comes from renewable electricity</p>	<p>6</p>	
<p><b>25 Water Use</b></p> <p>(Residential – Class 2 or 3)</p> <p>The building has low water use</p>	<p>The building installs efficient water fixtures:</p> <ul style="list-style-type: none"> <li>– Taps 5 star</li> <li>– Toilets 4 star</li> <li>– Urinals 5 star</li> <li>– Showers 3 star (&lt;= 7.5 l/m)</li> <li>– Dishwashers 5 star</li> <li>– Washing machines 4 star</li> </ul>	<p>MINIMUM EXPECTATION</p>	<p>Design Tender Construction Use</p>
<p><b>27 Movement and Place</b></p> <p>The building’s design and location encourage occupants</p>	<p>There are showers, lockers, and change rooms in the building for office and retail staff</p>	<p>MINIMUM EXPECTATION</p>	<p>Strategy Brief Concept Design</p>

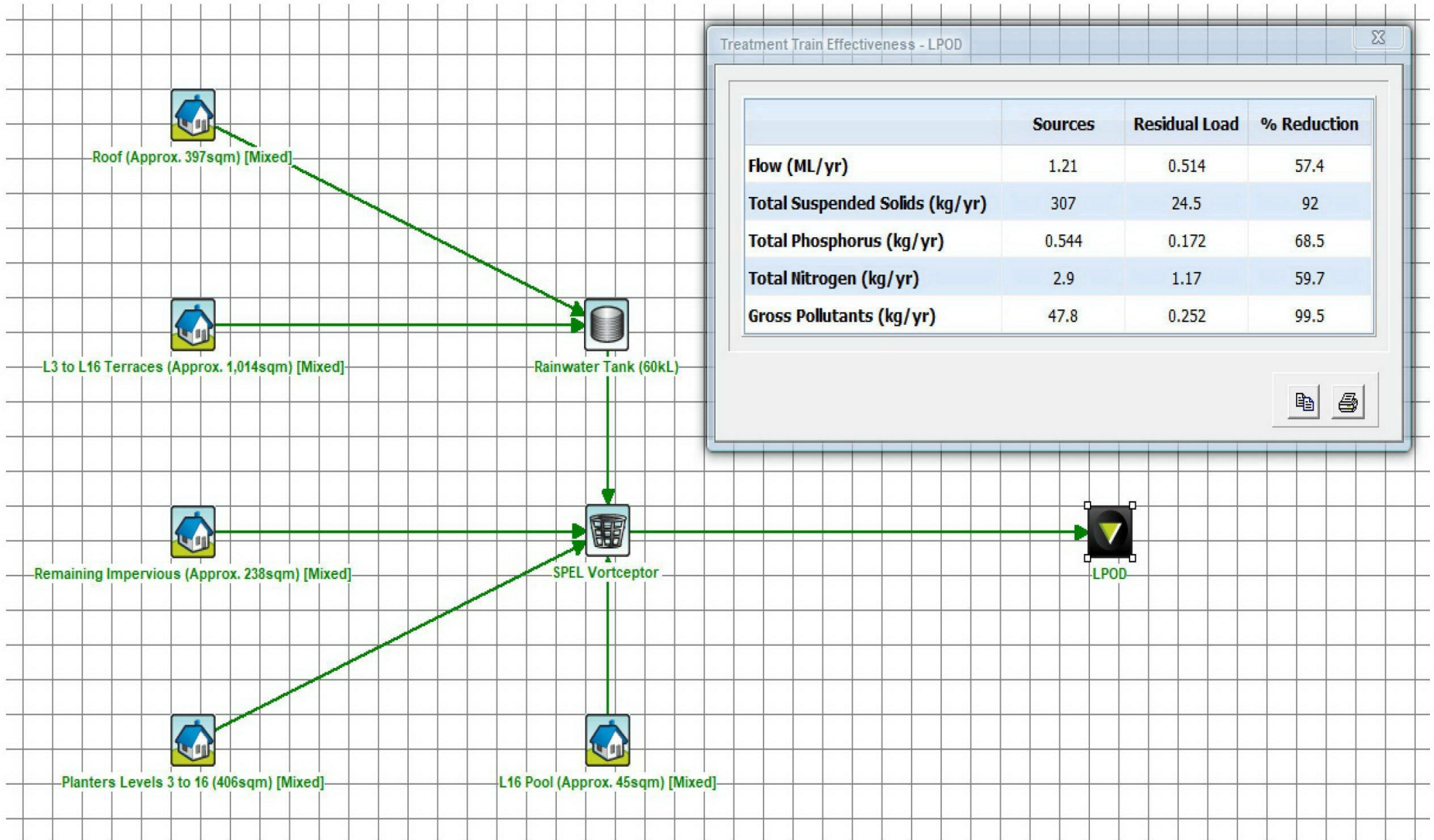
Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
<p>and visitors to use active, low carbon, and public transport options instead of private vehicles</p>	<p>The facilities for staff are accessible, inclusive, and located in a safe and protected space</p>		<p>Tender Construction</p>
	<p>The building's access prioritises cycling and includes bicycle parking facilities</p> <ul style="list-style-type: none"> <li>- 110 secure bicycle spaces, plus 22 spaces for visitors</li> <li>- Cycle maintenance rack and foot-pump</li> <li>- Commercial tenancy staff EoT facilities including: <ul style="list-style-type: none"> <li>- 4 shower,</li> <li>- 22 lockers</li> <li>- changing area with benching &amp; ironing facilities</li> </ul> </li> </ul> <p>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.</p>	<p><b>3</b></p>	
	<p>Sustainable Transport Plan to be prepared and implemented.</p>		
	<p>EV charging infrastructure:</p> <ul style="list-style-type: none"> <li>- Chargers to 5% of car spaces: 7 chargers (minimum 7kW capacity)</li> <li>- EV charging to include load management supervisor hardware</li> <li>- Electrical containment e.g. trunking/conduit installed to facilitate future installation of cabling supplying a further 20% of car spaces (37 spaces)</li> </ul>		
	<p>Transport options that reduce the need for private fossil fuel powered vehicles are prioritised.</p>		
	<p>Walkability encouraged via access to at least 10 amenities across 5 categories - Walkscore = 90%</p>		
<p><b>31 Inclusive Construction Practices</b></p> <p>The builder's construction practices promote diversity and reduces physical and mental health impacts</p>	<p>There are provisions for providing gender appropriate facilities and personal protective equipment</p> <p>The head contractor also installs policies on-site to increase awareness and reduces instances of discrimination, racism, and bullying</p>		<p>MINIMUM EXPECTATION</p>
<p><b>35 Impacts to Nature</b></p> <p>Ecological value is conserved and protected</p>	<p>The building was not built on, or significantly impacted, a site with a high ecological value</p> <p>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.</p>	<p>MINIMUM EXPECTATION</p>	<p>Strategy Brief Concept</p>

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	There is ongoing monitoring, reporting, and management of the site's wetland ecosystem		Design
	The project team must demonstrate how they have attempted to understand their site's historical and current ecological context by documenting the site's current ecological values by type and biomass. This includes terrestrial and aquatic ecological values, geologic features, and soils (including interaction with living things). When determining biodiversity value, the project must reference local, regional, state, and national priorities and strategies.	2	
	If deemed necessary by an Ecologist, at least 50% of existing site with high biodiversity value is retained.		
<b>39 Waterway Protection</b> 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 B.1 for discharge rates).	2	Concept Design
	Specified pollution reduction targets are met (Refer to Section 4.0 and Appendix B for MUSIC modelling results and assumptions)		Construction Handover
<b>Total Green Star Points</b>		<b>26</b>	
<b>Green Star Rating</b>		<b>4 Star</b>	

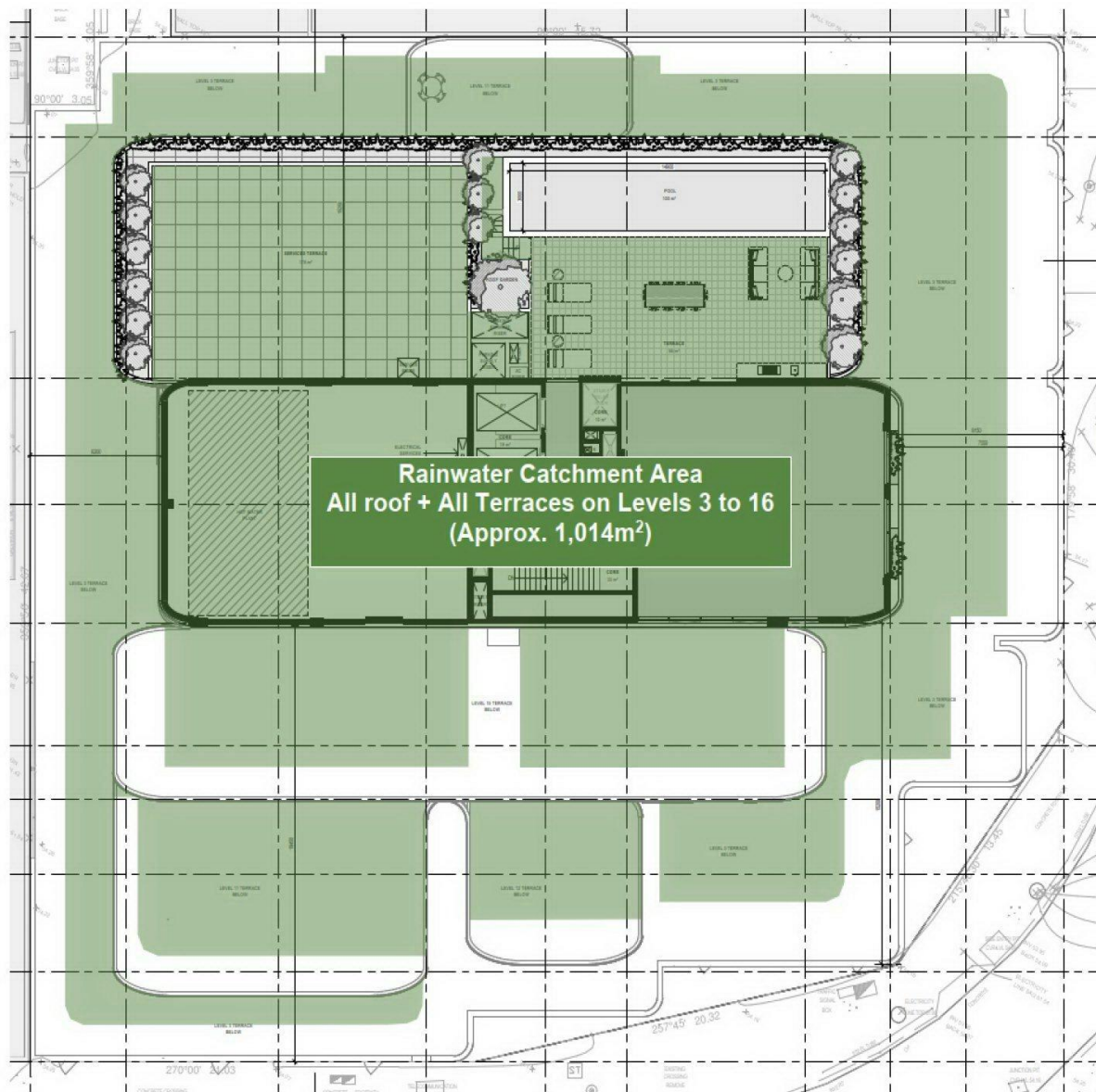


Appendix B. MUSIC Modelling

B.1 MUSIC Schematic



## B.2 Rainwater Catchment Areas



### B.3 MUSIC Modelling Assumptions and Results

Assumptions		
Area Name		
Total Roof Areas to Rainwater Tank		
All roof Areas		
Level 3 to Level 16 Terraces		
Landscape Planter Areas		
Swimming Pool		
Remaining Area		
<b>Total Site Area</b>		

MUSIC Model 25/07/2023		
Treatment Devices Features		
RWT		
Est. daily water demand for TF		
<b>All Office toilets Levels 1 &amp; 2, All residential toilets Levels 3, 4, 5 &amp; 6.</b>		
Est. annual demand for irrigation		
**Primary Treatment System 1 (GPT)		SPEL \

#### Results

Pollutant	MUSIC Model Results	Green Star Building Targets (Credit Achievement)
Reduction in Stormwater Discharge	57.4%	40.0%
Reduction in Total Suspended Solids (TSS)	92.0%	85.0%
Reduction in Total Phosphorus (TP)	68.5%	65.0%
Reduction in Total Nitrogen (TN)	59.7%	45.0%
Reduction in Total Gross Pollutants	99.5%	90.0%
<i>Compliance with Project Targets</i>		✓

#### NOTES:

\*\*Nutrient reduction (Phosphorous and Nitrogen) not attributed to GPT as per Melbourne Water MUSIC guidelines.

#### Acronyms

RWT: Rain Water Tank

TF: Toilet Flushing

GPT: Gross Pollutant Trap

MUSIC v6.3.0 Input Parameters	
<b>Rainfall data</b>	
Rainfall Range & Station Name	D - Koo Wee Rup (750-850mm)
10 Year Period	D -1971-1980
Mean annual rainfall	D - 769mm
Evapotranspiration	D - 1008
Time step	6 minutes
Estimation method	Stochastically generated

Soil properties - Melbourne	
Soil store capacity	120mm
Field capacity	50mm

GPT Pollutant Removal Rates	
Total Suspended Solids	70%
Total Phosphorous	0%
Total Nitrogen	0%
Gross Pollutants	98%
Validation report	<a href="#">CRC for Catchment Hydrology</a>

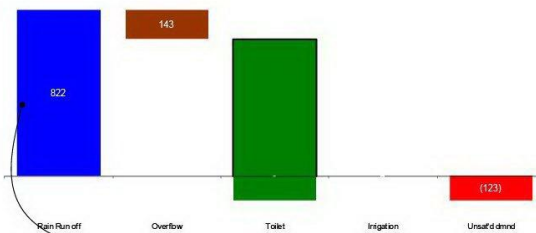
## B.4 Rainwater Harvesting and Tank Reliability

Property Version  
408 Clayton Road, Clayton

Inputs:		Irrigation Schedule	
<b>Commercial</b>	Floor Area - NLA (m2)	1643	
	PPL [ M / F ]	56	56
	Flush/Person/Day [ M - Urinal ]	2	
	Flush/Person/Day [ M / F - WC ]	0.3	2.3
	Litres/Flush [ Urinal / WC ]	1	3.3
	Total Daily usage (litres)	595	
<b>Residential</b>	PPL	80	
	Flush/Person/Day	5	
	Litres/Flush	4.00	
	Total Daily usage (litres)	1600	
<b>Development</b>	Total Daily usage (litres)	2195	
	Roof area (m2)	1,411	
	Collection Evaporation	5%	Recalc, update pivots, table and graphs
	Tank Capacity (litres)	60,000	
	Irrigation Area (m2)	0	
	Toff if Total Rain (mm)	10	
	in the last	5	days

	I	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 rainfall

	12 years of Averages (k l)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rain Run off	55	57	50	86	69	71	63	72	69	64	89	76	822
Overflow	(8)	(12)	(8)	(16)	(9)	(10)	(3)	(6)	(7)	(13)	(22)	(28)	(143)
Rain Water saved	48	45	42	69	61	61	60	65	62	51	67	48	680
Toilet	(68)	(62)	(68)	(66)	(68)	(66)	(68)	(68)	(66)	(68)	(66)	(68)	(801)
(Shortfall)/Surplus before Irrigation	(21)	(17)	(26)	4	(7)	(5)	(8)	(3)	(4)	(17)	1	(20)	(122)
Irrigation													
Unsatisfied Demand	(21)	(17)	(26)	4	(7)	(5)	(8)	(3)	(4)	(17)	1	(20)	(122)

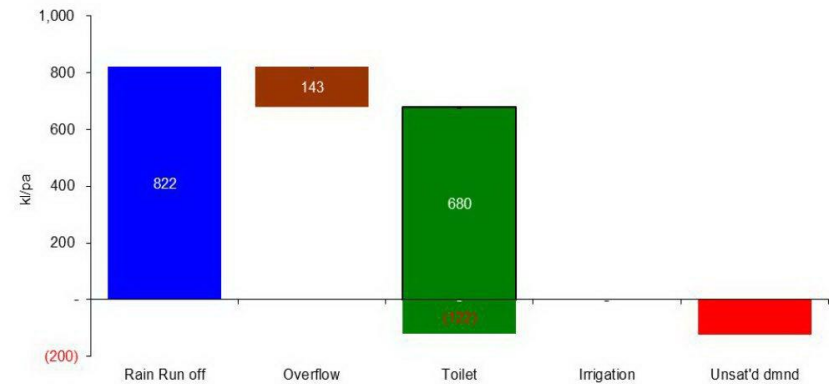
  

	Actual Years (k l)												Total
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Rain Run off	671	1,046	1,038	843	909	636	653	904	837	750	560	1,022	9,869
Overflow	(63)	(295)	(301)	(130)	(173)	(25)	(152)	(139)	(141)	(4)	(271)	(1,712)	(2,712)
Rain Water saved	588	750	736	713	736	810	853	754	698	609	557	751	8,156
Toilet	(801)	(801)	(801)	(803)	(801)	(801)	(801)	(803)	(801)	(801)	(801)	(799)	(9,618)
(Shortfall)/Surplus before Irrigation	(213)	(51)	(65)	(90)	(66)	(191)	(148)	(49)	(103)	(192)	(245)	(48)	(1,461)
Irrigation													
Unsatisfied Demand	(213)	(51)	(65)	(90)	(66)	(191)	(148)	(49)	(103)	(192)	(245)	(48)	(1,461)

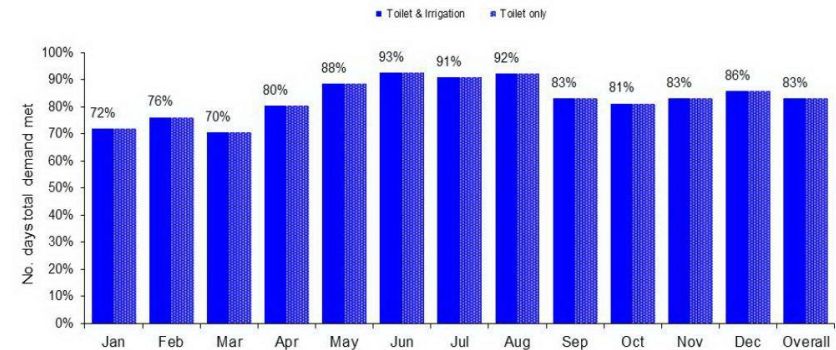
Reliability of supply (daily demand met)- Tank size what ifs

Tank	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
1k	13%	11%	12%	16%	23%	22%	22%	27%	21%	19%	17%	14%	18%
2k	13%	11%	12%	17%	26%	23%	23%	29%	22%	20%	18%	14%	19%
5k	24%	25%	26%	34%	47%	47%	45%	51%	41%	38%	35%	32%	37%
10k	32%	35%	35%	46%	63%	61%	59%	65%	53%	50%	46%	48%	49%
20k	46%	51%	48%	67%	81%	76%	70%	81%	70%	63%	63%	71%	66%
50k	69%	73%	66%	79%	88%	91%	88%	89%	82%	80%	79%	85%	81%
100k	79%	80%	82%	85%	92%	97%	94%	95%	89%	82%	91%	87%	88%
200k	87%	90%	96%	92%	94%	97%	97%	99%	93%	84%	92%	89%	93%

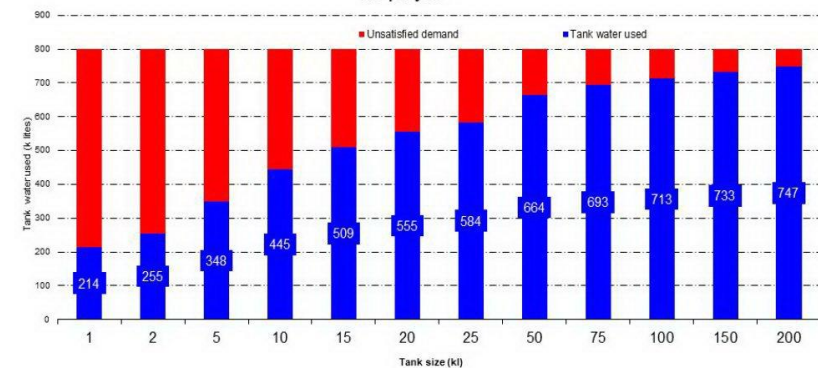
Graph 1 - The water System based on actual daily rainfall



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



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



## Appendix C. NatHERS Energy Rating Assumptions

## C.1 Results

Apartment	Star Rating	Energy Demand (MJ/m <sup>2</sup> )		
		Total	Heating	Cooling
301	6.8	96.8	80.5	16.3
302	6.6	103.1	82.1	21.0
303	6.4	112.5	99.9	12.6
304	6.8	97.0	78.1	18.9
305	7.2	85.1	65.6	19.5
306	6.9	92.9	73.7	19.2
307	8.2	53.4	42.5	10.9
308	7.4	77.5	66.6	10.9
309	5.9	129.9	114.4	15.5
310	6.9	95.3	76.0	19.3
311	5.9	128.4	113.8	14.6
312	6.7	101.4	81.2	20.2
701	7.6	70.6	50.1	20.5
702	7.4	78.9	58.2	20.7
703	7.3	81.3	68.8	12.5
704	7.4	77.1	61.3	15.8
705	6.9	93.7	76.4	17.3
706	6.7	101.6	82.7	18.9
707	7.3	82.7	72.4	10.3
708	6.9	93.7	83.8	9.9
709	5.9	129.4	112.1	17.3
710	6.3	115.9	96.5	19.4
711	6.9	93.4	74.3	19.1
712	7.3	81.0	62.1	18.9

1001	7.4	75.1	56.1	19.0
1002	6.8	96.8	85.1	11.7
1003	6.8	98.3	84.8	13.5
1004	7.3	80.0	64.7	15.3
1005	6.7	101.3	84.4	16.9
1006	6.4	108.8	90.5	18.3
1007	7.1	88.9	79.1	9.8
1008	6.8	96.9	86.0	10.9
1009	5.6	139.9	122.5	17.4
1010	5.8	133.8	113.4	20.4
1011	6.7	100.5	81.5	19.0
1012	6.9	91.4	72.2	19.2
1301	8.0	58.0	42.5	15.5
1302	8.6	40.4	28.0	12.4
1303	8.6	40.3	27.6	12.7
1304	8.0	57.9	39.8	18.1
1305	7.4	76.1	62.3	13.8
1306	7.1	88.5	73.4	15.1
1307	7.8	63.6	57.2	6.4
1308	6.9	92.2	79.2	13.0
1309	7.3	81.2	63.9	17.3
1310	7.3	81.7	63.4	18.3
1401	7.9	58.2	42.7	15.5
1402	8.6	40.7	28.3	12.4
1403	8.6	40.5	27.8	12.7
1404	7.9	58.1	40.1	18.0
1405	7.4	76.8	62.7	14.1
1406	7.3	80.7	67.6	13.1

1407	7.1	88.8	78.3	10.5
1408	6.3	116.1	99.4	16.7
1409	7.3	81.8	64.4	17.4
1410	7.3	82.0	63.8	18.2
1501	7.2	85.2	66.0	19.2
1502	7.7	66.8	51.6	15.2
1503	7.7	69.9	53.6	16.3
1504	7.3	82.3	61.9	20.4
1505	7.1	86.7	71.7	15.0
1506	6.6	104.5	89.0	15.5
1507	6.4	108.7	88.1	20.6
<b>Estimated Development Average</b>	<b>7.0</b>	<b>87.2</b>	<b>71.2</b>	<b>15.9</b>

## C.2 Building Materials

Element	Description	Added R Value
Floor Type	Suspended concrete	
Floor Insulation	50mm Kingspan Kooltherm K10 G2 R 2.3 soffit board: Underside of concrete floor to level 3 apartments shared with carpark below	R 2.3
Wall Insulation	Lightweight party walls: 75mm R 1.5 bulk insulation	R 1.5
	Lightweight corridor walls: 75mm R 1.5 bulk insulation	R 1.5
	Precast concrete Lift & stairwell walls: 25mm R 0.65 bulk insulation	R 0.65
	Precast concrete external walls: 90mm R 2.5 bulk insulation	R 2.5
	External lightweight walls: 90mm R 2.5 bulk insulation	R 2.5
Roof Insulation	70mm Kingspan Kooltherm K10 G2 R 3.2 soffit board: Underside of concrete ceiling/roof sections with terrace and external roof / services above	R 3.2
Roof Colour	Solar Absorptance - 0.5	
Window Frames	Aluminium frames & Aluminium thermally broken frames to windows and glazed doors Refer to glazing schedule	
Window Colour	Solar Absorptance - 0.91	
Sky Lights	Nil	

### 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.3 Glazing

Window Type	Description	Whole of Window Value		Location
		U	SHGC	
Aluminium Sliding Door	Capral 900 Series: Clear Double Glazed Low-e 6EA/12Ar/6	3.19	0.48	Apartment glazing, excluding apartments listed below
Aluminium Fixed Window	Capral 419 Series: Clear Double Glazed Low-e 6/12Ar/6EA	2.71	0.58	Apartment glazing, excluding apartments listed below
Aluminium Awning Window	Capral 35 Series: Clear Double Glazed Low-e 6EA/12Ar/6	4.42	0.41	Apartment glazing, excluding apartments listed below
Aluminium Hinged Door	Capral 200 Series: Clear Double Glazed Low-e 6EA/12Ar/6	3.60	0.44	Apartment glazing, excluding apartments listed below
Aluminium Sashless Double Hung	Aneeta Series: Clear Double Glazed Low-e 4/8Ar/4ET	3.48	0.56	Apartment glazing
Aluminium Sliding Door	Capral 900 Series: Clear Double Glazed Insulglass 24mm Insulglass Max	2.69	0.25	Apt 301: All West facing Apt 304: All East facing Apt 311: West facing living Apt 701: North facing living Apt 1001: North facing living
Aluminium Fixed Window	Capral 419 Series: Clear Double Glazed Insulglass 24mm Insulglass Max	2.70	0.26	Apt 704: 2 x East facing bedrooms Apt 710: 2 x West facing bedrooms
NatHERS Software Equivalent	CAP-055-50 419 Flushline Double glazed 8.38mm CPGy37/12Argon gap/6mm Clear	2.70	0.26	Apt 1004: 2 x East facing bedrooms Apt 1010: 2 x West facing bedrooms
Aluminium Awning Window	Capral 35 Series: Clear Double Glazed Insulglass 24mm Insulglass Max	4.42	0.20	Apt 704: 2 x East facing bedrooms Apt 710: 2 x West facing bedrooms Apt 1004: 2 x East facing bedrooms Apt 1010: 2 x West facing bedrooms
Thermally Broken Aluminium Sliding Door	Capral Futureline SD Series: Clear Double Glazed Low-e 6ET/12Ar/6	2.40	0.40	Apt 1009: Living & bedroom Apt 1010: Bedroom
NatHERS Software Equivalent	AWS-089-08 A RES SERIES 704 FLUSH SLIDING DOOR DG 638ComPlsGy_12Ar_6mmClr	2.41	0.40	All level 13 – 15 apartments, excluding apartment 1505



Thermally Broken Aluminium Fixed Window	Capral Futureline 419TB Series: Clear Double Glazed Low-e 6ET/12Ar/6	2.16	0.51	Apt 1010: Living All level 13 – 15 apartments, excluding apartment 1505
Thermally Broken Aluminium Awning Window	Capral Futureline 54W Series: Clear Double Glazed Low-e 6ET/12Ar/6	2.87	0.39	All level 13 – 15 apartments, excluding apartment 1505
Thermally Broken Aluminium Hinged Door	Capral Futureline 46D Series: Clear Double Glazed Low-e 6ET/12Ar/6	2.73	0.42	Apt 1010: Living All level 13 – 15 apartments, excluding apartment 1505

#### 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.4 General Rating Assumptions

Item	Details
Floor Coverings	Tiles to bathrooms and laundries Carpet to bedrooms Timber boards to kitchen, living and all other areas
Window Coverings	Holland blinds to all windows. (Regulation Mode) <sup>1</sup>
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.

<sup>1</sup> Holland blinds are assumed as required by VBA Practice Note 55 (Clause 5.2). This assumption is for regulatory purposes only.

Appendix D. WSUD Maintenance Manual

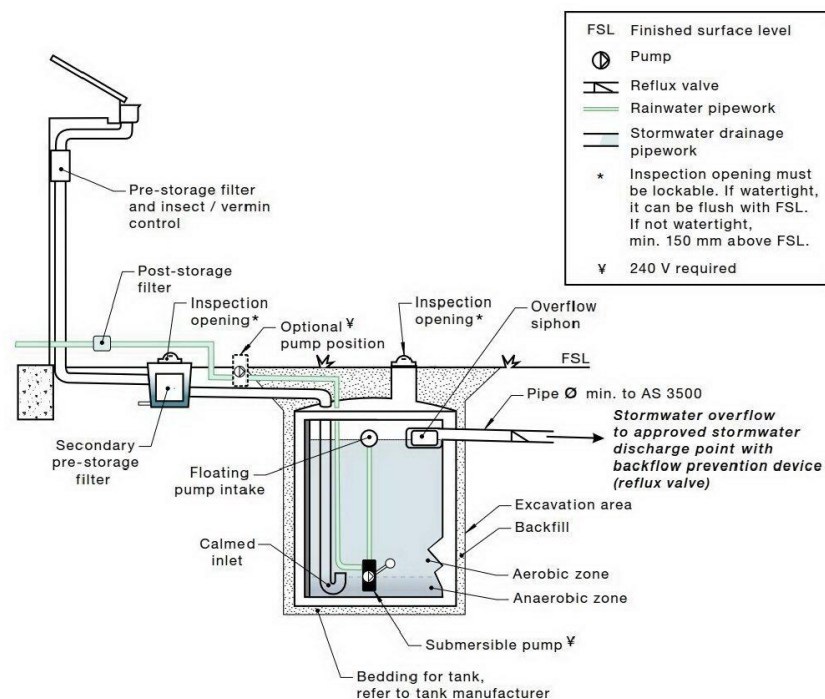
Once installed, a systematic maintenance program will be implemented by the owner's corporation maintenance contractor to ensure the rainwater harvesting system operates as designed and water quality is maintained.

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<sup>2</sup>. 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 device. Consider a manual switching device.
Mesh cover	Has the mesh cover deteriorated or have any holes in it?		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 28.2 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 440Wp capacity (i.e. over 33% more efficient than traditional 360Wp 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 33.5 MWh per annum equating to an estimated annual carbon emissions offset of 30.8 tonnes CO2-e per annum.



Figure 1 Indicative Solar Photovoltaic array layout

## East facing array output

### RESULTS

16,744 kWh/Year\*

Print Results

Month	Solar Radiation ( kWh / m <sup>2</sup> / day )	AC Energy ( kWh )
January	6.89	2,283
February	6.04	1,813
March	4.80	1,630
April	3.20	1,050
May	2.11	716
June	1.85	610
July	1.83	635
August	2.68	934
September	3.86	1,292
October	5.24	1,790
November	5.64	1,839
December	6.63	2,172
<b>Annual</b>	<b>4.23</b>	<b>16,744</b>

#### User Comments

Type here to add optional comments to printout.

Download Results: [Monthly](#) | [Hourly](#)

[Find A Local Installer](#)

\* Caution: The PVWatts energy estimate is based on an hourly performance simulation using a typical-year weather file that represents a multi-year historical period for 409 Clayton Road, Clayton VIC for a Fixed (open rack) photovoltaic system.

These results are based on assumptions described in [Help](#) that may not accurately represent technical characteristics of the project you are modeling.

#### Location and Station Identification

Requested Location	409 Clayton Road, Clayton VIC
Weather Data Source	Lat, Lng: -37.91, 145.1 1.6 mi
Latitude	37.91° S
Longitude	145.10° E

#### PV System Specifications

DC System Size	14.1 kW
Module Type	Premium
Array Type	Fixed (open rack)
System Losses	14.08%
Array Tilt	13°
Array Azimuth	90°

## West facing array output

### RESULTS

16,763 kWh/Year\*

Print Results

Month	Solar Radiation ( kWh / m <sup>2</sup> / day )	AC Energy ( kWh )
January	6.96	2,293
February	6.12	1,839
March	4.79	1,625
April	3.22	1,053
May	2.14	728
June	1.86	615
July	1.80	622
August	2.66	920
September	3.80	1,270
October	5.17	1,761
November	5.74	1,874
December	6.60	2,163
<b>Annual</b>	<b>4.24</b>	<b>16,763</b>

#### User Comments

Type here to add optional comments to printout.

Download Results: [Monthly](#) | [Hourly](#)

[Find A Local Installer](#)

\* Caution: The PVWatts energy estimate is based on an hourly performance simulation using a typical-year weather file that represents a multi-year historical period for 409 Clayton Road, Clayton VIC for a Fixed (open rack) photovoltaic system.

These results are based on assumptions described in [Help](#) that may not accurately represent technical characteristics of the project you are modeling.

#### Location and Station Identification

Requested Location	409 Clayton Road, Clayton VIC
Weather Data Source	Lat, Lng: -37.91, 145.1 1.6 mi
Latitude	37.91° S
Longitude	145.10° E

#### PV System Specifications

DC System Size	14.1 kW
Module Type	Premium
Array Type	Fixed (open rack)
System Losses	14.08%
Array Tilt	13°
Array Azimuth	270°

## Appendix F. Site Management Plan

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 Modelling

Based on a computer simulation model using IES VE software, this report provides a summary of the internal daylight levels achieved in accordance with the council's best practice design standards. The model accounts for shading and obstructions provided by adjacent and equitable structures.

### G.1 Modelled Results

Apartment	Level	DF % > 1
APT. 301	Level 3	61.0
APT. 302	Level 3	67.5
APT. 303	Level 3	84.6
APT. 304	Level 3	98.5
APT. 305	Level 3	90.1
APT. 306	Level 3	100
APT. 307	Level 3	100
APT. 308	Level 3	100
APT. 309	Level 3	100
APT. 310	Level 3	100
APT. 311	Level 3	77.1
APT. 312	Level 3	63.9
APT. 401	Level 4	60.4
APT. 402	Level 4	67.5
APT. 403	Level 4	90.0
APT. 404	Level 4	100
APT. 405	Level 4	84.1
APT. 406	Level 4	94.5
APT. 407	Level 4	100
APT. 408	Level 4	100
APT. 409	Level 4	100
APT. 410	Level 4	100
APT. 411	Level 4	63.8
APT. 412	Level 4	60.6

Table 2: Modelled Results for Living/Kitchen Areas

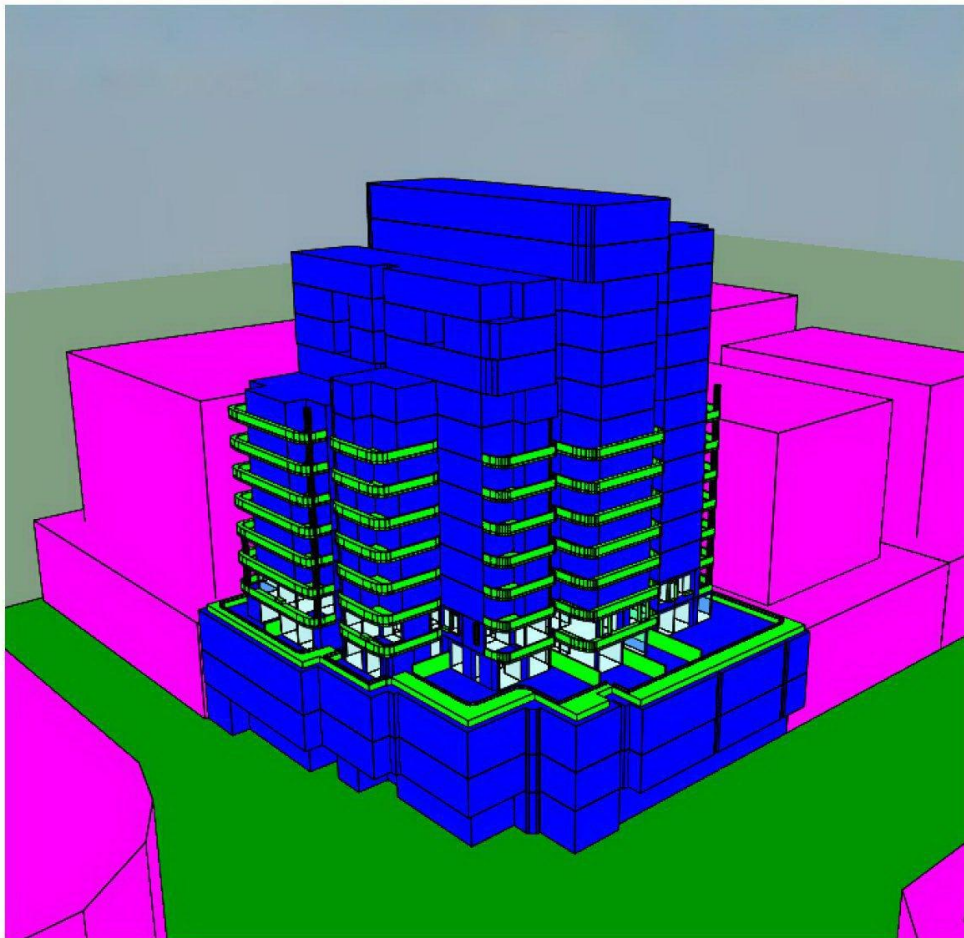


Apartment/Bedroom	Level	DF % > 1
APT. 301 - Master Bedroom	Level 3	100
APT. 301 - Bedroom 2	Level 3	100
APT. 302 - Master Bedroom	Level 3	95.7
APT. 302 - Bedroom 2	Level 3	100
APT. 303 - Master Bedroom	Level 3	100
APT. 303 - Bedroom 2	Level 3	96.3
APT. 304 - Master Bedroom	Level 3	100
APT. 304 - Bedroom 2	Level 3	100
APT. 305 - Master Bedroom	Level 3	100
APT. 306 - Master Bedroom	Level 3	100
APT. 307 - Master Bedroom	Level 3	100
APT. 307 - Bedroom 2	Level 3	100
APT. 308 - Master Bedroom	Level 3	100
APT. 308 - Bedroom 2	Level 3	100
APT. 309 - Master Bedroom	Level 3	100
APT. 310 - Master Bedroom	Level 3	100
APT. 310 - Bedroom 2	Level 3	100
APT. 311 - Master Bedroom	Level 3	91.3
APT. 312 - Master Bedroom	Level 3	100
APT. 312 - Bedroom 2	Level 3	100
APT. 401 - Master Bedroom	Level 4	100
APT. 401 - Bedroom 2	Level 4	100
APT. 402 - Master Bedroom	Level 4	77.6
APT. 402 - Bedroom 2	Level 4	92.5
APT. 403 - Master Bedroom	Level 4	100
APT. 403 - Bedroom 2	Level 4	92.9
APT. 404 - Master Bedroom	Level 4	100
APT. 404 - Bedroom 2	Level 4	100

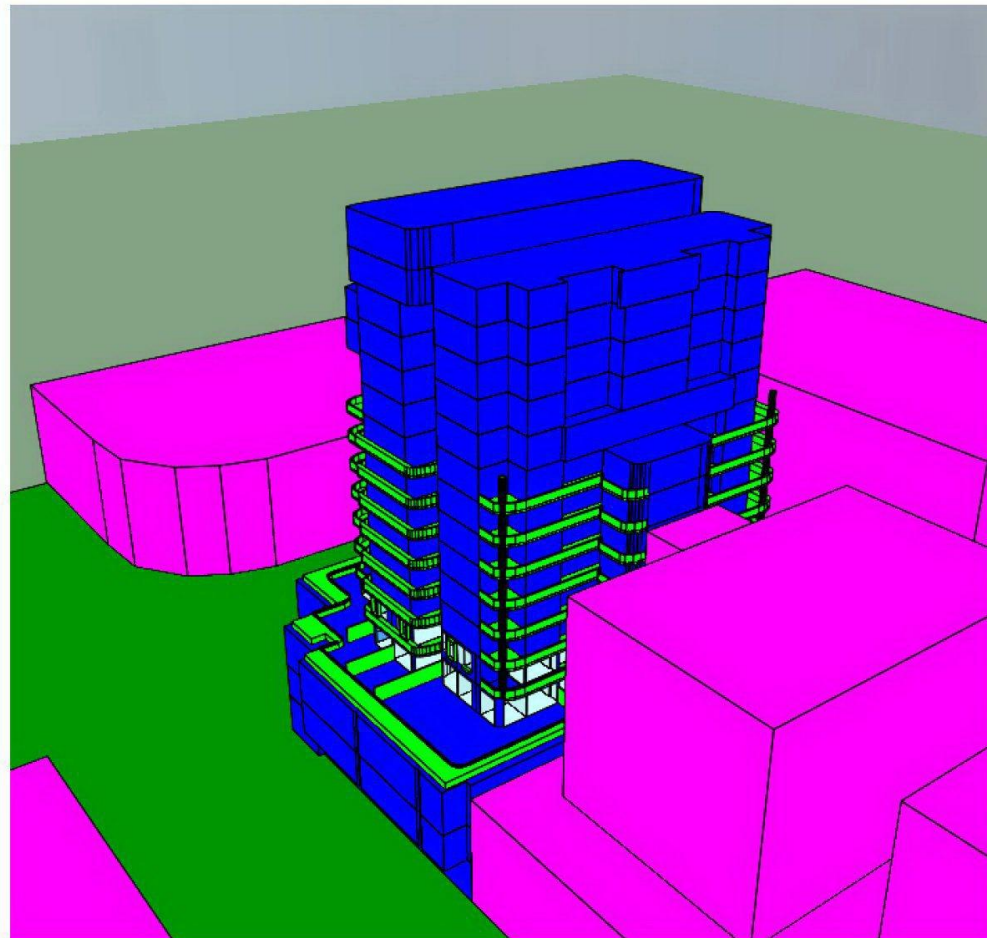
APT. 405 - Master Bedroom	Level 4	100
APT. 406 - Master Bedroom	Level 4	100
APT. 407 - Master Bedroom	Level 4	100
APT. 407 - Bedroom 2	Level 4	100
APT. 408 - Master Bedroom	Level 4	100
APT. 408 - Bedroom 2	Level 4	100
APT. 409 - Master Bedroom	Level 4	100
APT. 410 - Master Bedroom	Level 4	100
APT. 410 - Bedroom 2	Level 4	100
APT. 411 - Master Bedroom	Level 4	60.8
APT. 412 - Master Bedroom	Level 4	100
APT. 412 - Bedroom 2	Level 4	100

Table 3: Modelled Results for Bedrooms

G.2 Model Images

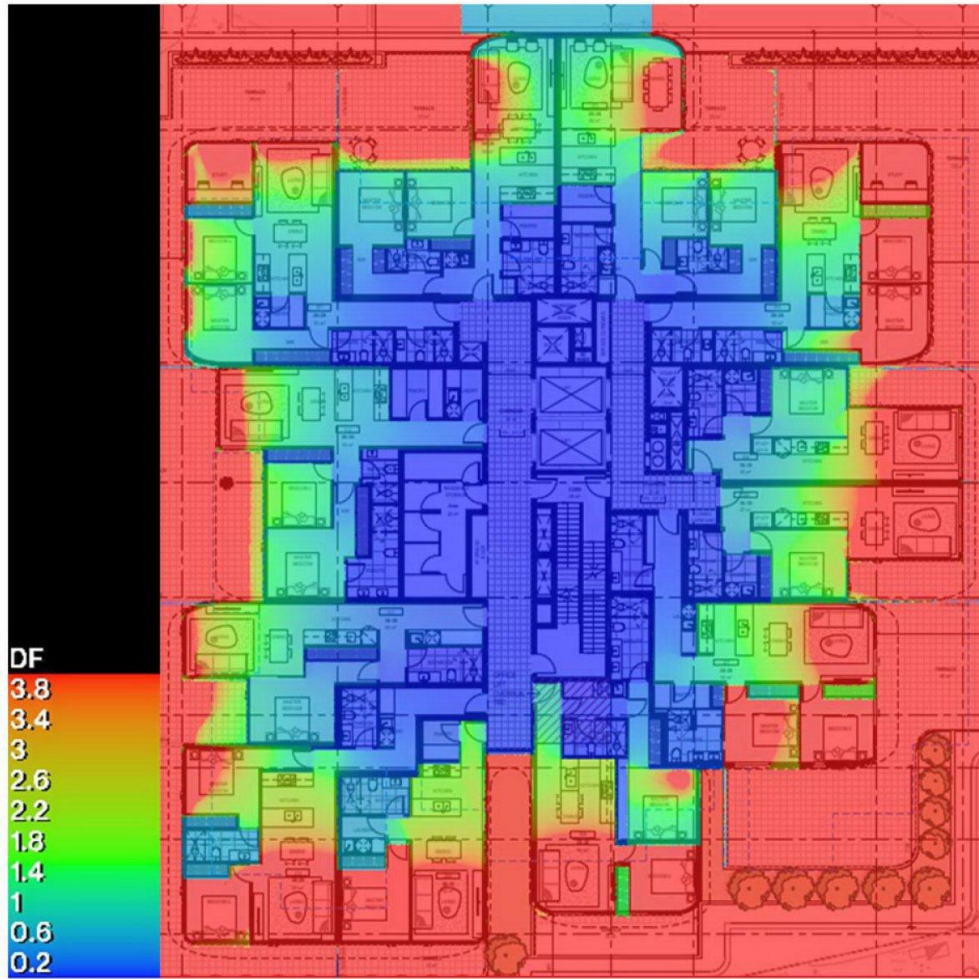


IES Model view from South-East

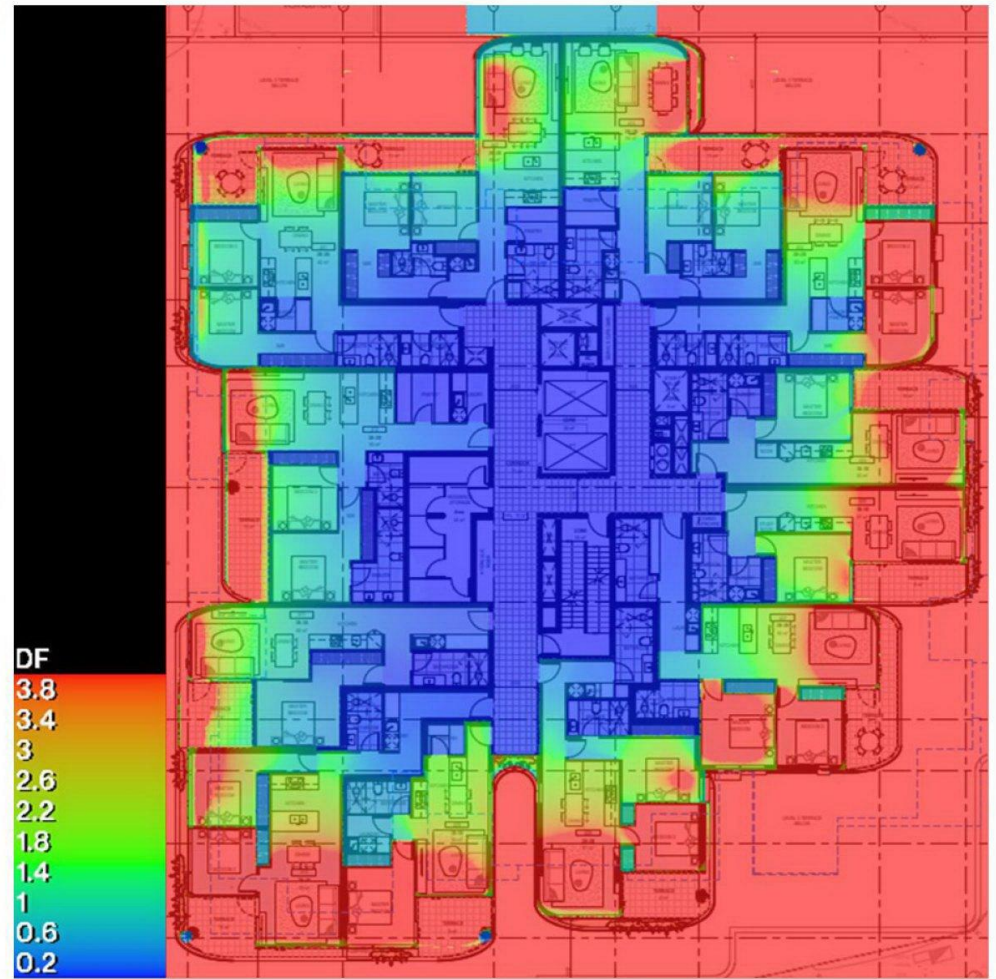


IES Model view from North-East

### G.3 Daylight Contour Plots



Level 3 Daylight Factor Contour plot



Level 4 Daylight Factor Contour plot

## G.4 Assumptions

### Assumed Glazing Visual Light Transmittance

Glazing Type	Visible Light Transmittance (VLT)
	%
Exterior glazing clear (L3-10)	70

Sky conditions: 10K Lux CIE overcast sky

### Assumed Surface Reflectances

Construction Element	Reflectance (%)	Description
Floors	30	Light-coloured flooring
Internal Walls	94	Dulux Vivid white paint
Ceilings	94	Dulux Vivid white paint
External Fabric	40	Medium-coloured finish
Balcony Walls and Soffits	70	Light-coloured finish
Adjacent/Equitable Buildings	40	Medium-coloured finish
External Paving	40	Light-coloured pavers
Roads	10	Tarmac

Suite 8/10 Northumberland Street  
South Melbourne VIC 3205 Australia

+61 3 9636 0280  
[info@arkresources.com.au](mailto:info@arkresources.com.au)

[arkresources.com.au](http://arkresources.com.au)

Ark Resources