EMERGEN

SUSTAINABILITY DESIGN REPORT

EDWARD MILLEN RESERVE PRECINCT

VICTORIA PARK, WA, 6100

PREPARED BY

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CONTENTS

DEFINITIONS

GROSS FLOOR AREA (GFA)

Gross Floor Area (GFA) refers to the combined floor area of all permanently covered parts of a building that can be protected from the elements. In the context of Green Star, it is important to note that car parking, including under cover car parking, should generally be excluded from the GFA unless specifically stated otherwise.

WATER EFFICIENCY LABELLING STANDARDS (WELS) SCHEME

The Water Efficiency Labelling Standards (WELS) scheme is implemented in Australia to ensure that specific products are registered and labelled with their water efficiency. This scheme operates in accordance with the standards established under the national Water Efficiency Labelling and Standards Act 2005.

DAYLIGHT FACTOR

The daylight factor refers to the ratio between the light level inside a structure and the light level outside the structure. It is used to measure and assess the amount of natural daylight that penetrates into a building.

PREDICTIVE MEAN VOTE

The Predicted Mean Vote (PMV) is an index used to predict the average rating of thermal sensation by a large group of individuals on a 7-point thermal sensation scale, ranging from +3 (hot) to -3 (cold). It is based on the heat balance of the human body, where thermal equilibrium is achieved when the body's internal heat production equals the heat loss to the surrounding environment. In a moderate environment, the human thermoregulatory system automatically adjusts skin temperature and sweat secretion to maintain thermal balance.

A PMV value between -1 and +1 corresponds to a Predicted Percent Dissatisfied (PPD) of no more than 25%, indicating that 25% or less of the occupants may feel dissatisfied or uncomfortable. A PMV value between -0.5 and +0.5 corresponds to a PPD of 10%. It is important to note that even with a PMV value of zero, there may still be a 5% dissatisfaction or discomfort among occupants.

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1 STATE PLANNING POLICY SUMMARY

EMERGEN (a division of CADDS GROUP), in collaboration with the design team (Blackoak Capital), has developed a sustainable design strategy for the proposed Edward Millen Reserve Precinct, aligning with *State Planning Policy 7.0*, which focuses on the Design of the Built Environment - specifically, Principle 5: Sustainability.

This report serves the vital purpose of bolstering the development application by articulating the sustainability principles and commitments for the project site. We acknowledge the significance of State Planning Policy 7.0 in promoting sustainability within the built environment. Good design, as outlined in the policy, is not only about aesthetics but also optimises the sustainability of our built surroundings, yielding positive outcomes on environmental, social, and economic fronts.

Our approach to sustainable landscape and urban design adheres closely to the established water-sensitive urban design principles, ensuring minimal adverse impacts on existing natural features and ecological processes while promoting green infrastructure at all scales of the project. Furthermore, our strategy for sustainable built environments embraces passive environmental design measures tailored to local climate and site conditions. This includes careful consideration of optimal orientation, shading, thermal performance, and natural ventilation, ultimately reducing reliance on energy-intensive heating and cooling technologies. This, in turn, results in reduced energy consumption, decreased resource usage, and lowered operating costs throughout the project's lifecycle.

In alignment with the policy, our commitment extends to the use of sustainable construction materials, rigorous recycling practices, responsible waste management, the incorporation of reusable materials and existing structures, harnessing renewable energy sources, and comprehensive management of the total water cycle. By adhering to these sustainability principles and State Planning Policy 7.0, we aim to create Edward Millen commercial development that not only thrives in terms of design and functionality but also stands as a model for environmentally responsible development within the region.

1.1 DESIGN AND CONSTRUCT TO AUSTRALIAN BEST PRACTICE

EMERGEN will utilise a structured approach to a sustainable outcome for the design and construction of the development including goal and commitments.

Table 1 – Sustainability Commitments

DESCRIPTION	GOAL	SUSTAINABILITY COMMITMENTS
CLEAR AIR	Improve indoor environment quality and health and wellbeing of occupants.	Outdoor air provided to primary areas at a rate at least **50%** greater than minimum in AS 1668.2:2012. *(TBC based on mechanical consultant).*
LIGHT QUALITY		Above **70%** of the regularly occupied areas have high level of daylight (above 160 Lux).
EXPOSURE TO TOXINS		The building's paints adhesives, sealants, and carpets are low in TVOC or non-toxic. The building's engineered wood products are low in TVOC or non-toxic. Occupants are not exposed to banned or highly toxic materials in the building.
HEAT RESILIENCE	Reduce impacts of long-term performance.	Large areas of vegetation on site (community farmers market, parkland lawn, lawn terraces and garden pavilion). Approx **60%** of whole site dedicated to lowering Heat Island Effect
UPFRONT CARBON	Reduce carbon footprint	Approx **60%** reduction in upfront carbon for re-use of existing heritage building.
CIRCULAR ECONOMY	Resources	On-site production at the core, aligning with the circular economy ethos. This means that food is grown, consumed, and waste is repurposed locally.
ENERGY USE	Reduce emissions and water use.	A minimum of **30%** offset in operational energy usage for each building (no battery installed). We have also outlined options for a **50%** offset (pending budget).
WATER USE		Prescriptive High WELS Ratings (these equal a **35%** reduction in potable water).
LIGHTING USE		**20%** reduction in lighting power when compared to NCC
MOVEMENT AND PLACE	Low carbon options.	Bike parking provided. **5%** of carparking bays dedicated to EV's/
DESIGN FOR INCLUSION	Social Health	Gender Neutral Toilets *(subject to tenant requirements)* Giving priority to produce grown onsite and used in the precinct kitchen, bakery and childcare.
CULTURE, HERITAGE, AND IDENTITY	Cultural Centre	A museum/gallery will be located in the Mildred Creak building, and indigenous art will be incorporated into the park and our heritage development. Further details will be finalised in the next 2-3 months.

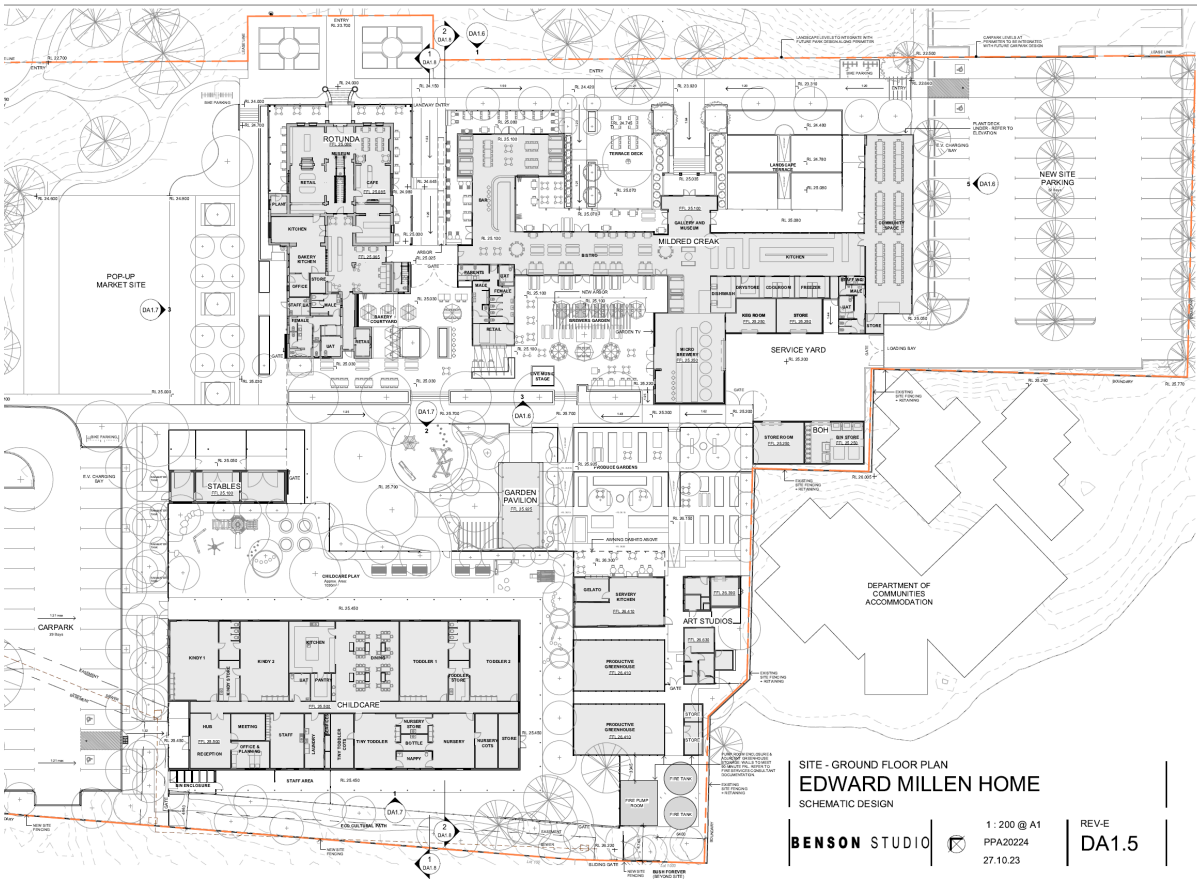
	Indigenous Inclusion	planning a walking trail that commences in the parklands, traverses our site, and ultimately connects to the adjacent Bush Forever site to the southeast.
BIODIVERSITY ENHANCEMENT	Improved Nature outcomes.	Enhance shade by planting more native trees locally, aligning with climate resilience and native plant preservation. The precinct's kitchens will recycle organic waste, using it for compost in vegetable gardens or as feed for on-site small-scale livestock like chickens and goats.

2 PROJECT INFORMATION

Blackoak Capital is currently engaged in the development of Edward Millen Reserve Precinct.

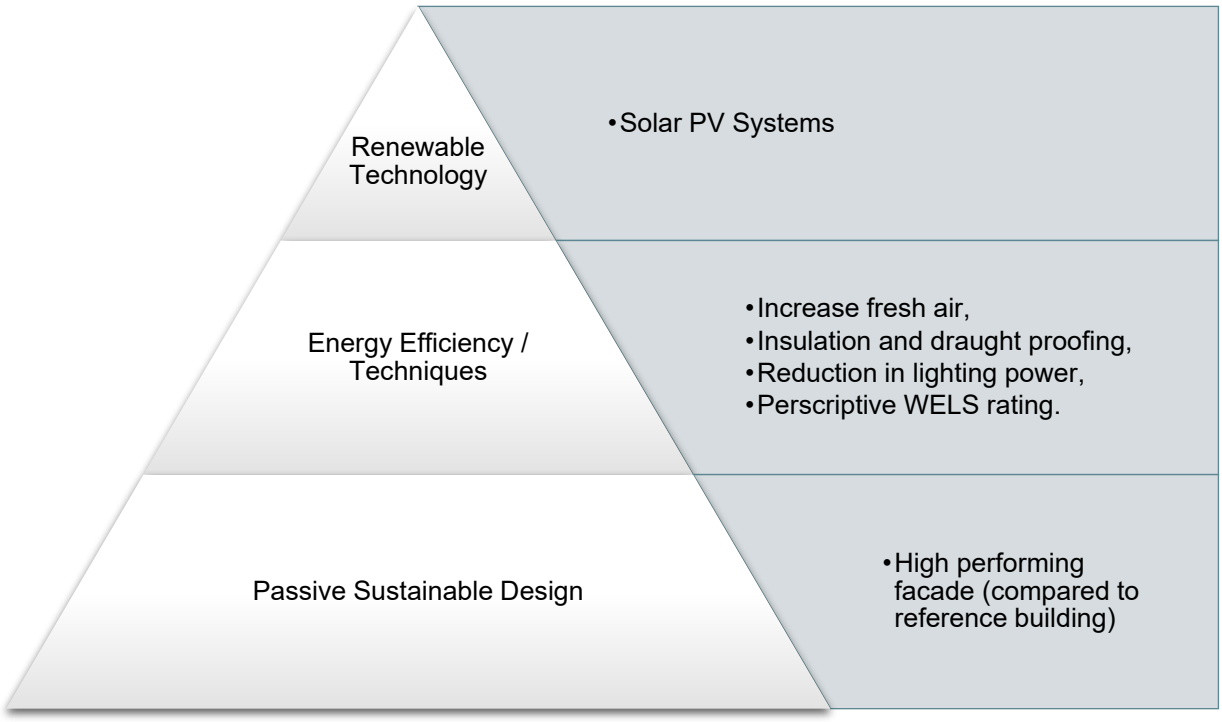
Table 2 Project Summary

Space Name	Classification	Approx. Floor Area (m^2)
Childcare Centre	Class 9b	925.0
Rotunda	Class 6	638.0
Mildred Creak	Class 6	1885.0



3 ENERGY REDUCTION STRATEGY

Table 5 Energy Reduction Strategy



3.1 REFERENCE BUILDING SPECIFICATIONS

Table 6 Reference Building

Model	Description
Reference Building	Building structure as designed, but with DTS walls, ceilings, floors, windows etc.; All services and operations proposed in the building, to the maximum allowed under DTS

4 BUILDING FABRIC ASSESSMENT

EMERGEN conducted an initial simulation of the building design to offer early advice on the building fabric. The objective was to identify areas prone to excessive heat and propose strategies to mitigate them.

IMPACT OF SOLAR GAINS

Solar gains are the most significant heat gain to the building, in summer occurring throughout the middle of the day and lowering throughout the day.

Possible Solutions includes:

a. Section of glass with medium solar heat gain (see Table 8)

CONDUCTION GAINS

External windows are a heavy gain during the middle of the day in summer, followed by minor gain/loss through walls and insignificant gain through the ceiling due to NCC stringent requirements.

Possible Solutions includes:

b. Low U value of Glass (see section Glass selection)
c. High Insulation R-Values for external walls

The following graphs highlight the areas within the conditioned spaces where heat gain and loss occur throughout summer and winter.

4.1 LOAD ANALYSIS

4.1.1 ROTUNDA

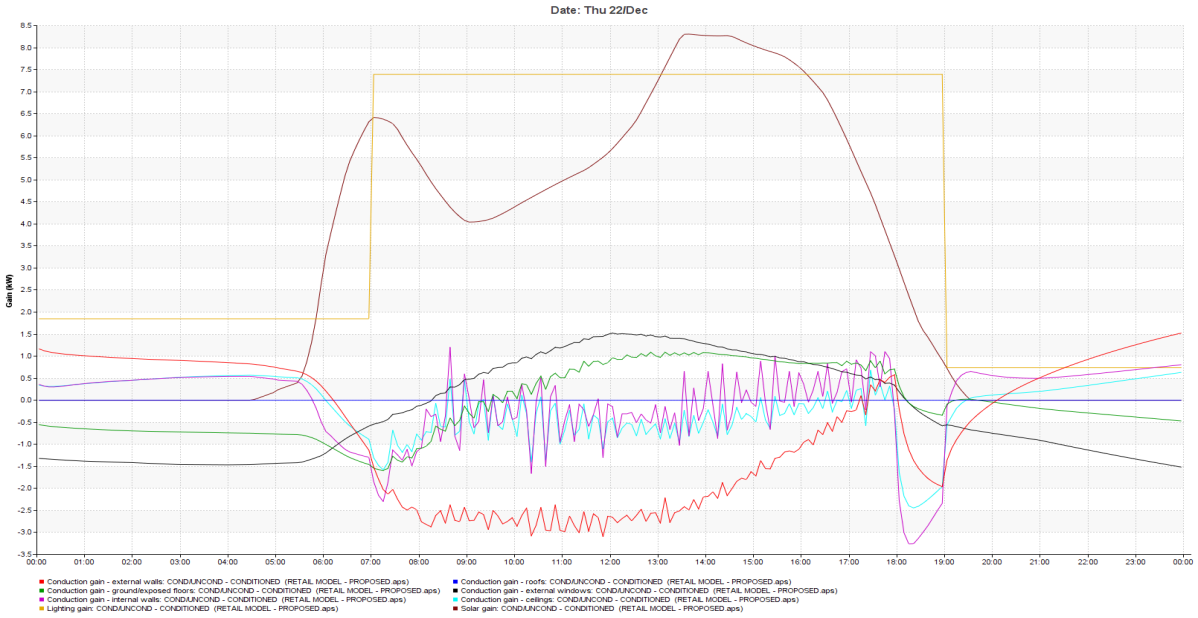


Figure 2 Typical Summer Day Load

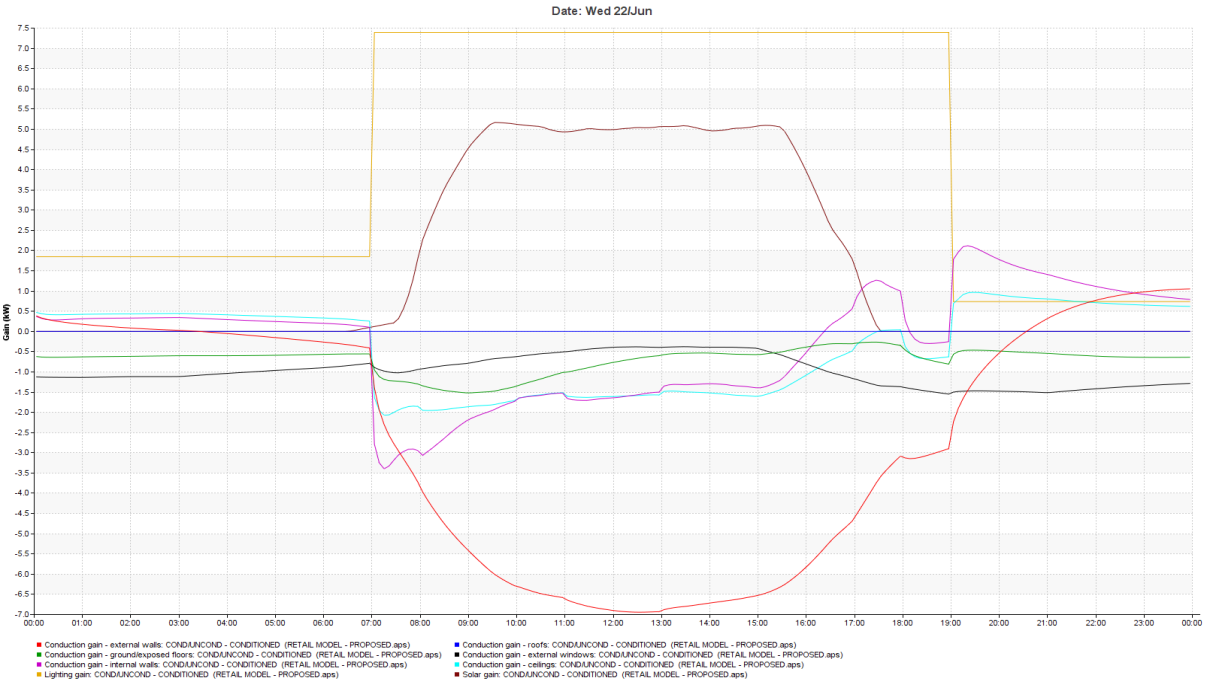


Figure 3 Typical Winter Day Load

4.1.2 CHILDCARE

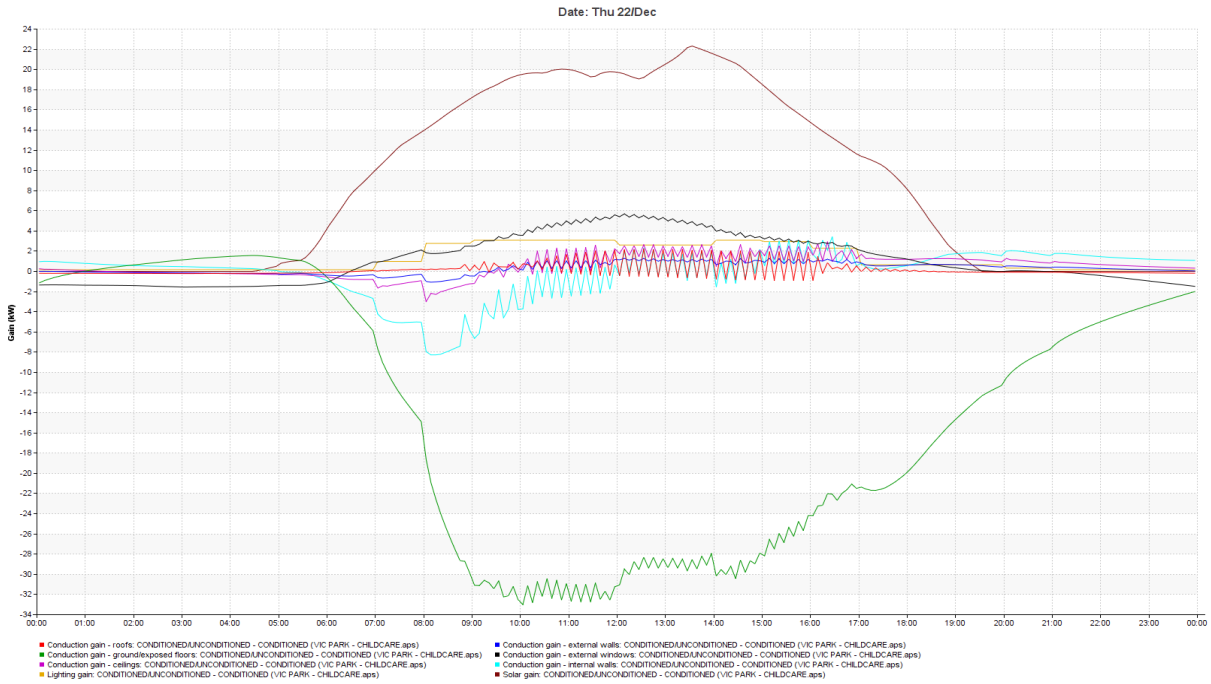


Figure 4 Typical Summer Day Load

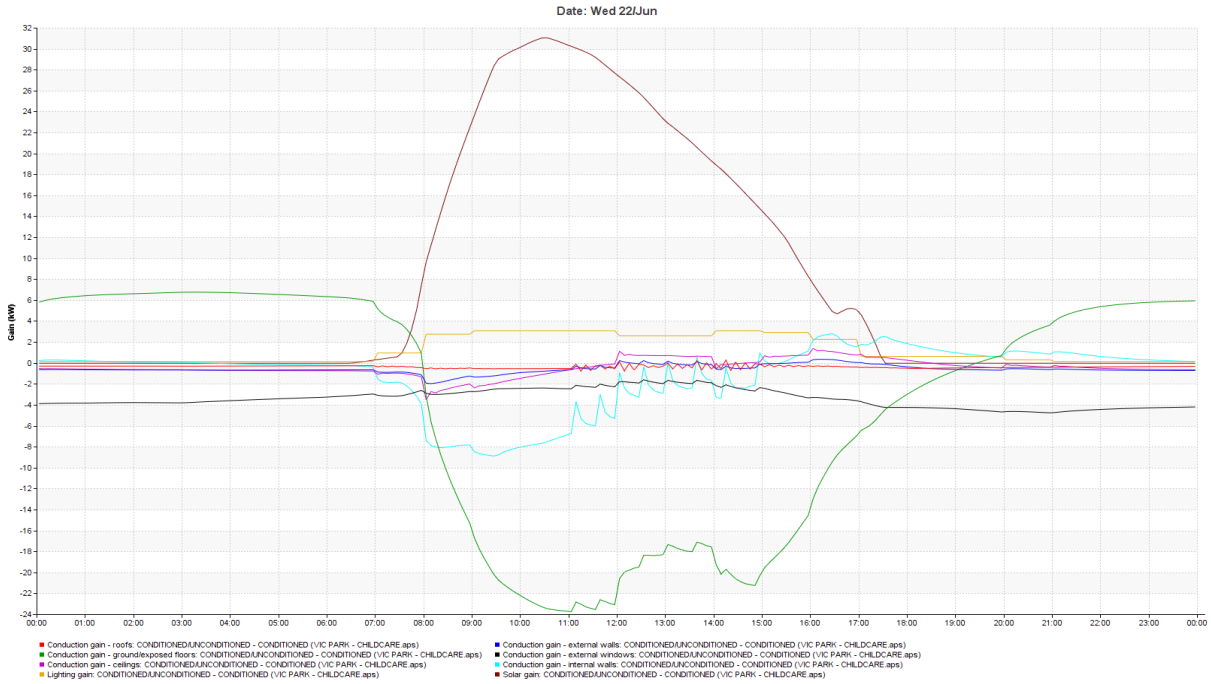


Figure 5 Typical Winter Day Load

4.1.3 MILDRED CREAK

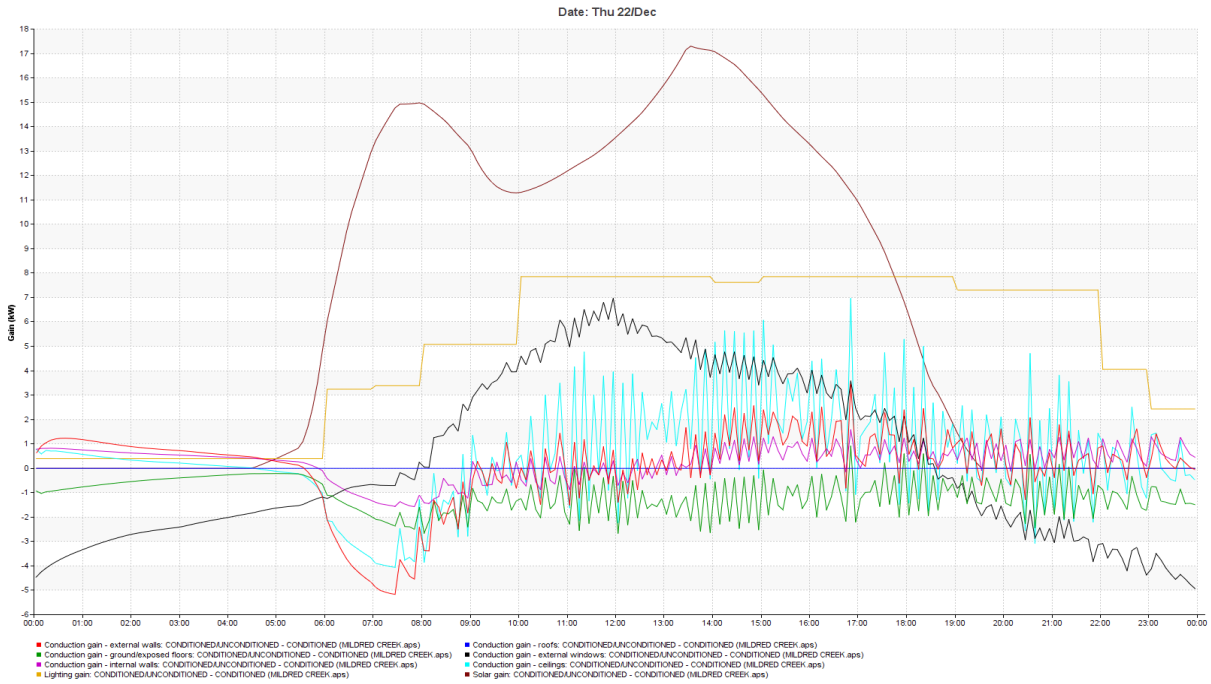


Figure 6 Typical Summer Day Load

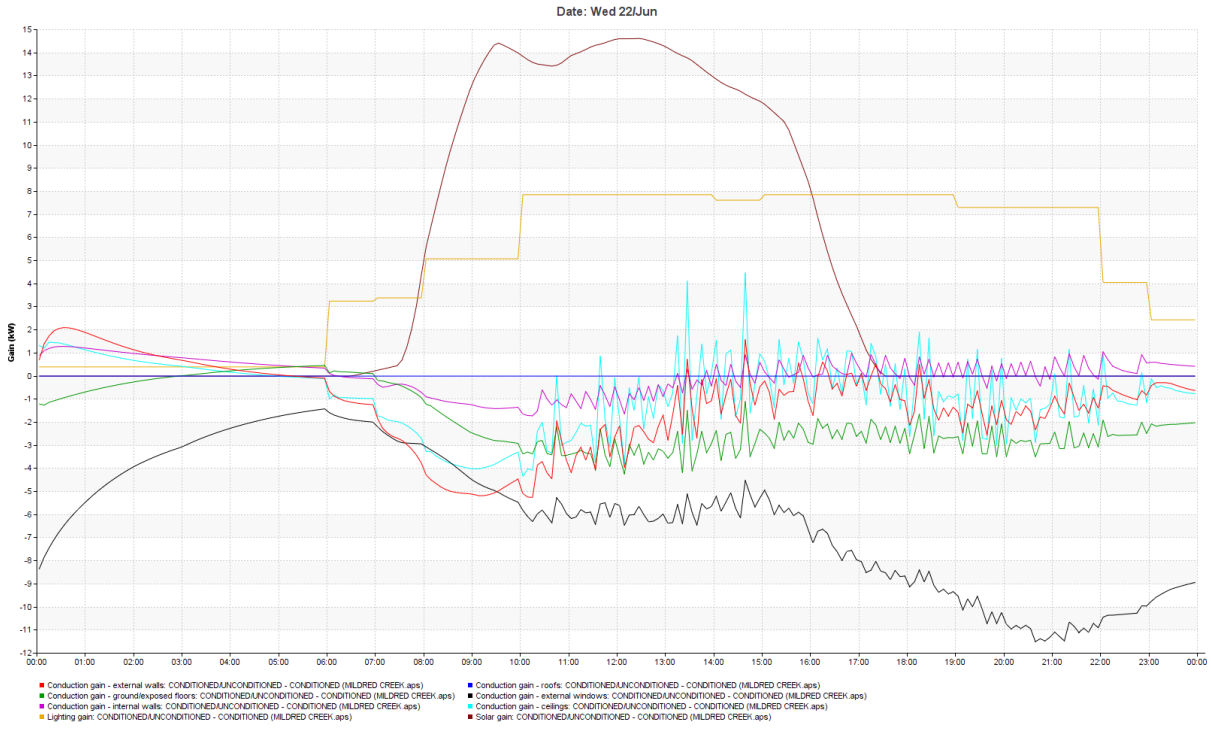


Figure 7 Typical Winter Day Load

4.2 SOLAR ANALYSIS

EMERGEN has conducted an analysis that highlights periods of significant solar gains and identifies potential opportunities. The current shading device is operating at a good level and providing adequate shading for the project.

4.2.1 ROTUNDA

During summer, low solar gains (peaking at 8.1kW) occur primarily at 3.45pm.

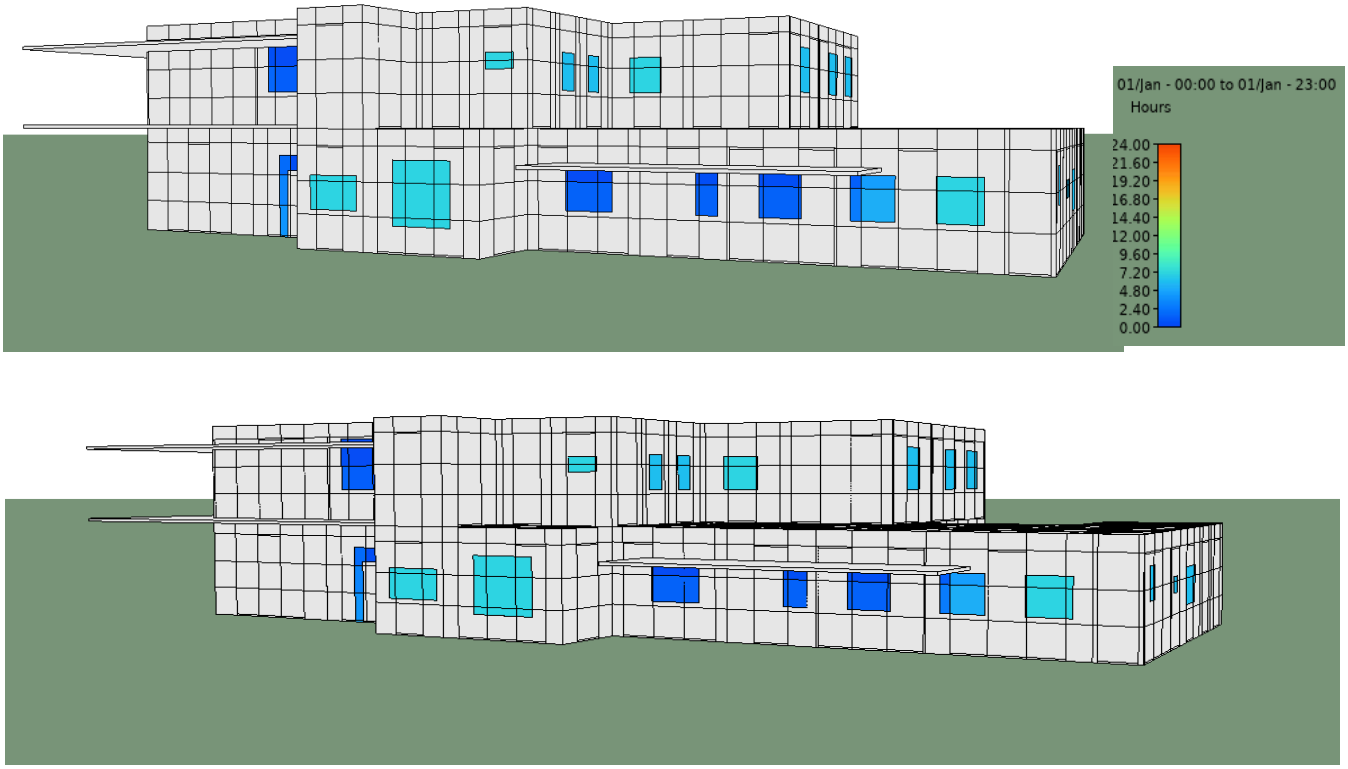


Figure 10: Solar Gains During Summer for Retail

4.2.2 CHILDCARE

During summer, relatively low solar gains (peaking at 20kW) occur primarily at 10:30pm

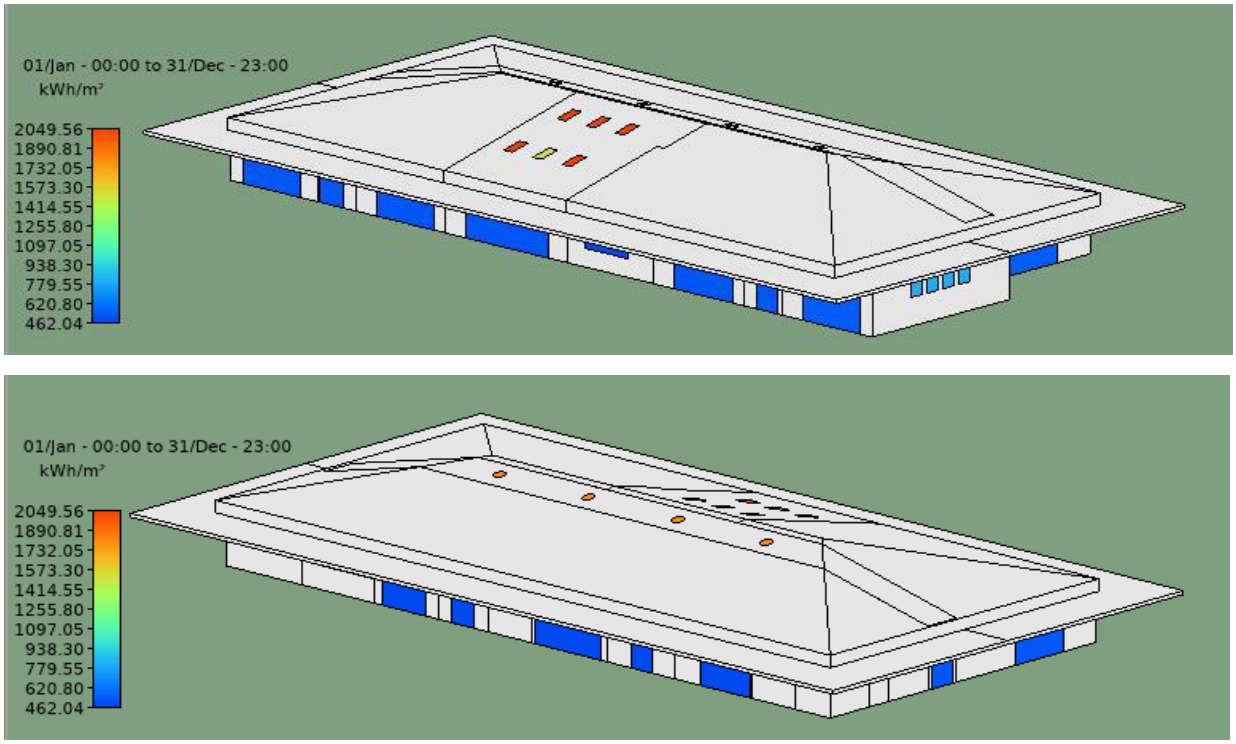


Figure 11: Solar Gains During Summer for Childcare

4.2.3 MILDRED CREAK

During summer, low solar gains (peaking at 17.0kW) occur primarily at 1:30pm.

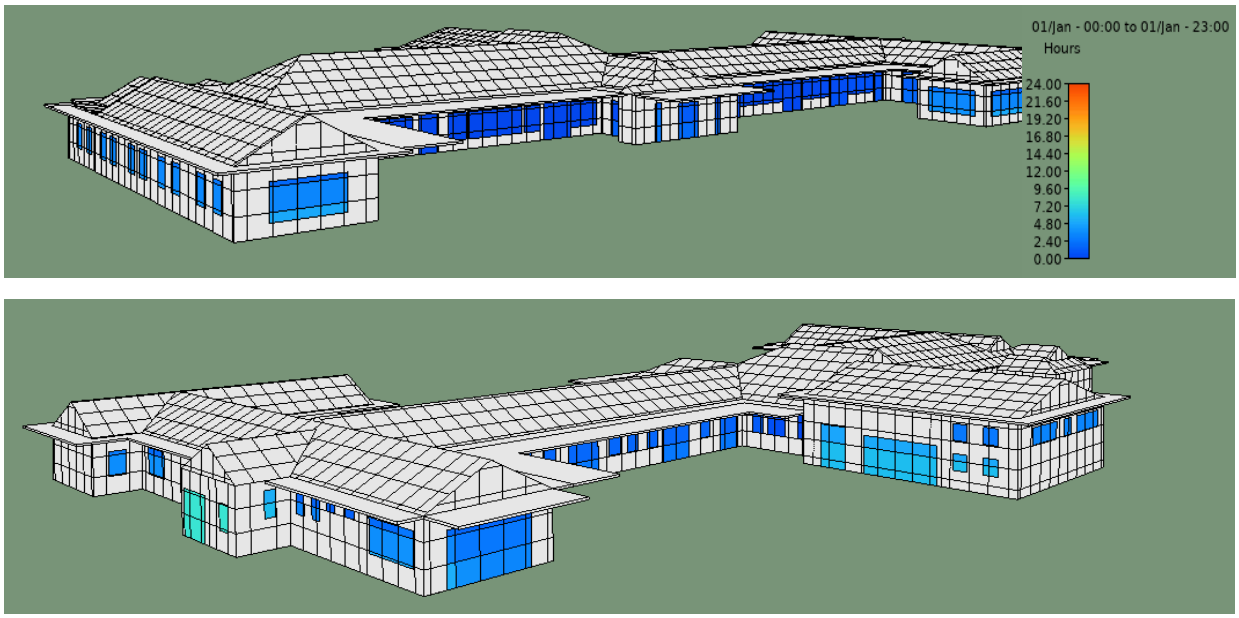


Figure 12 Solar Gains During Summer for Retail

5 PROPOSED BUILDING FABRIC SPECIFICATION

Based on the modelled outcome EMERGEN suggest the following building fabric and glazing specification.

5.1 ROTUNDA

Table 7 – Proposed Building Specification

CONSTRUCTION		DESCRIPTION	REQUIREMENT
ENVELOPE WALLS	**External Brick Wall**	300mm Clay brick wall, float and set internal finish	**No Insulation Required.**
	Internal Brick Wall	150mm Clay Brick wall, float and set internal finish.	**No Insulation Required.**
INTERNAL WALLS	**Timber Framed Wall**	Timber stud wall, plasterboard lining.	**No Insulation Required.**
	Internal Brick Wall	150mm Clay Brick wall, float and set internal finish.	**No Insulation Required.**
FLOORS	**Suspended Timber Floor (GF)**	Timber flooring, suspended frame on stumps.	**R2.5 Batts Under Flooring** (ie. Bradford Optimo Underfloor Insulation, or equal)
	Suspended Timber Floor (FF)	Timber flooring, suspended frame, dropped plasterboard ceiling.	**No Insulation Required.**
ROOFS	**Clay roof tiles**	Existing clay roof tiles, **(SA: 0.65),** dropped plasterboard ceiling.	Retrofit **R4.0 Insulation Batts** to dropped plasterboard ceilings

WINDOW SPECIFICATION		U-Value	SHGC
TYPE 1:	Single Clear glazing in commercial aluminium frame. (i.e., 6.00mm Viridian VFloat Clear, or equal)	**6.28**	**0.76**
TYPE 2:	Existing Windows to remain as is. (worst case values assumed)	**7.00**	**0.80**

Note: Glazing values provided are for Whole System (Frame + Glass)

Use of solar control glass such as Low-E grey can cause thermal stress in glass. Thermal stress breakage is not covered by the manufacturer's warranty. The risk of thermal stress breakage can be eliminated by heat treating the glass ie. heat strengthening or toughening. It is recommended that a thermal assessment is undertaken prior to tender.

5.1.1 ROTUNDA RESULTS

The figures shown below demonstrate the difference in performance between the proposed building and the reference building, allowing for a quantifiable comparison on the performance of each building.

Table 8 – Estimated Energy Use

ESTIMATED ENERGY USE AS PER 30% SOLAR OFFSET							
MODEL	Heating	Cooling	Fans	Lights	Equip	PV	Total
REFERENCE (KWH/M2)	3.6	70.5	37.3	202.7	51.3	-	**365.4**
PROPOSED (KWH/M2)	6.5	60.7	35.7	202.7	51.3	**- 112.5**	**244.5**
ENERGY REDUCTION							**33.09%**

A **25kW** solar PV system has been modelled with the proposed building to help offset total energy consumption.

ESTIMATED ENERGY USE AS PER 50% SOLAR OFFSET							
MODEL	Heating	Cooling	Fans	Lights	Equip	PV	Total
REFERENCE (KWH/M2)	3.6	70.5	37.3	202.7	51.3	-	**365.4**
PROPOSED (KWH/M2)	6.5	60.7	35.7	202.7	51.3	**- 179.5**	**177.5**
ENERGY REDUCTION							**51.44%**

A **40kW** solar PV system has been modelled with the proposed building to help offset total energy consumption.

Table 9 - Predicted Mean Vote (PMV) Summary

PREDICTED MEAN VOTE - % HOURS IN RANGE FOR	<= -1.00	>-1.00 TO <=1.00	>1.00
Class 6	0.00	99.98	0.02

5.2 CHILDCARE BUILDING SPECIFICATION.

Table 10 – Proposed Building Specification

CONSTRUCTION		DESCRIPTION	REQUIREMENT
ENVELOPE WALLS	**Steel Framed Wall**	Fibre Cement Cladding on Steel Frame	**R2.5 Batts with R0.2 Thermal Break**
INTERNAL WALLS	**Steel Framed Wall**	Steel frame, plasterboard lining.	**No insulation required.**
FLOORS	**Concrete Slab on Ground**	150mm Concrete slab on ground	**No insulation required.**
ROOFS	**Zincalume Metal Roof**	Zincalume sheeting **(SA: 0.65, as per schematics),** dropped plasterboard ceiling.	**60mm Anticon R1.3, R4.0 Insulation Batts** to dropped plasterboard ceilings

WINDOW SPECIFICATION		U-Value	SHGC
EXTERNAL GLAZING	Single Clear glazing in commercial aluminium frame. (i.e., 6.00mm Viridian VFloat Clear, or equal)	**6.28**	**0.76**

Note: Glazing values provided are for Whole System (Frame + Glass)

5.2.1 CHILDCARE RESULTS

The figures shown below demonstrate the difference in performance between the proposed building and the reference building, allowing for a quantifiable comparison on the performance of each building.

Table 11 – Estimated Energy Use

ESTIMATED ENERGY USE AS PER 30% SOLAR OFFSET							
MODEL	Heating	Cooling	Fans	Lights	Equip	PV	Total
REFERENCE (KWH/M2)	1.7	22.0	14.3	13.3	12.0	-	**63.2**
PROPOSED (KWH/M2)	1.9	16.4	13.3	13.3	12.0	**- 12.3**	**44.6**
ENERGY REDUCTION							**30.44%**

A **10kW** Solar PV system has been modelled with the proposed building to help offset total energy consumption.

ESTIMATED ENERGY USE AS PER 50% SOLAR OFFSET							
MODEL	Heating	Cooling	Fans	Lights	Equip	PV	Total
REFERENCE (KWH/M2)	1.7	22.0	14.3	13.3	12.0	-	**63.2**
PROPOSED (KWH/M2)	1.9	16.4	13.3	13.3	12.0	**- 24.7**	**32.2**
ENERGY REDUCTION							**50.05%**

A **20kW** solar PV system has been modelled with the proposed building to help offset total energy consumption.

Table 12 - Predicted Mean Vote (PMV) Summary

PREDICTED MEAN VOTE - % HOURS IN RANGE FOR	<= -1.00	>-1.00 TO <=1.00	>1.00
Class 9b	0.00	99.68	0.32

5.3 MILDRED CREAK BUILDING SPECIFICATION.

Table 13 – Proposed Building Specification

CONSTRUCTION		DESCRIPTION	REQUIREMENT
ENVELOPE WALLS	**External Brick Wall**	Existing brick cavity wall to micro-brewery. External finishes as per elevations.	**R2.0 Insulation Requirement.** Option 1: Internal metal stud frame, R2.0 Wall batts + R0.2 TB Option 2: R2.0 Rigid Insulation board, e.g., 50mm Kingspan Kooltherm k17
	External Stud frame	Existing timber stud frame with fibre cement cladding, plasterboard internal lining. External finishes as per elevations.	**R2.0 Wall Batts fitted between studs.**
INTERNAL WALLS	**Timber Framed Wall**	Timber stud wall, plasterboard lining.	**No Insulation Required.**

FLOORS	**Suspended timber floor (GF)**	Timber flooring, suspended frame on stumps.	**R2.0 Batts under flooring** (e.g., Bradford Optimo Underfloor Insulation, or equal)
ROOFS	**Clay Roof Tiles**	Existing clay roof tiles, **(SA: 0.65),** dropped plasterboard ceiling.	**R4.0 Insulation Batts** to dropped plasterboard ceilings

WINDOW SPECIFICATION		U-Value	SHGC
TYPE 1:	Replace all glazing with Single Low E glazing in commercial aluminium frame. (i.e., 6.38mm **Viridian Comfort Plus Clear**, or equal). Alternatively, will need to refurbish existing frames and provide new glass.	**4.42**	**0.64**

Note: Glazing values provided are for Whole System (Frame + Glass)

Use of solar control glass such as Low-E grey can cause thermal stress in glass. Thermal stress breakage is not covered by the manufacturer's warranty. The risk of thermal stress breakage can be eliminated by heat treating the glass ie. heat strengthening or toughening. It is recommended that a thermal assessment is undertaken prior to tender.

5.3.1 MILDRED CREAK RESULTS

The figures shown below demonstrate the difference in performance between the proposed building and the reference building, allowing for a quantifiable comparison on the performance of each building.

Table 13 – Estimated Energy Use

ESTIMATED ENERGY USE AS PER 30% SOLAR OFFSET							
MODEL	Heating	Cooling	Fans	Lights	Equip	PV	Total
REFERENCE (KWH/M2)	22.4	94.2	22.9	55.3	18.2	-	**213.0**
PROPOSED (KWH/M2)	22.1	91.7	22.0	55.3	18.2	**- 59.0**	**150.2**
ENERGY REDUCTION							**30.46%**

A **50kW** solar PV system has been modelled with the proposed building to help offset total energy consumption.

ESTIMATED ENERGY USE AS PER 50% SOLAR OFFSET							
MODEL	Heating	Cooling	Fans	Lights	Equip	PV	Total
REFERENCE (KWH/M2)	22.4	94.2	22.9	55.3	18.2	-	**213.0**
PROPOSED (KWH/M2)	22.1	91.7	22.0	55.3	18.2	**- 106.2**	**103.1**
ENERGY REDUCTION							**51.59%**

A **90kW** solar PV system has been modelled with the proposed building to help offset total energy consumption.

Table 14 - Predicted Mean Vote (PMV) Summary

PREDICTED MEAN VOTE - % HOURS IN RANGE FOR	<= -1.00	>-1.00 TO <=1.00	>1.00
Class 6	**1.37**	**98.50**	**0.14**

6 HEALTH AND WELLBEING

6.1 PROVISIONS FOR INCREASED OUTDOOR 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. It is proposed that outdoor air provided to primary areas will be at a rate at least 50% greater than minimum in AS 1668.2:2012, this will need to be confirmed by the mechanical engineer.

6.2 VISUAL COMFORT /DAYLIGHT

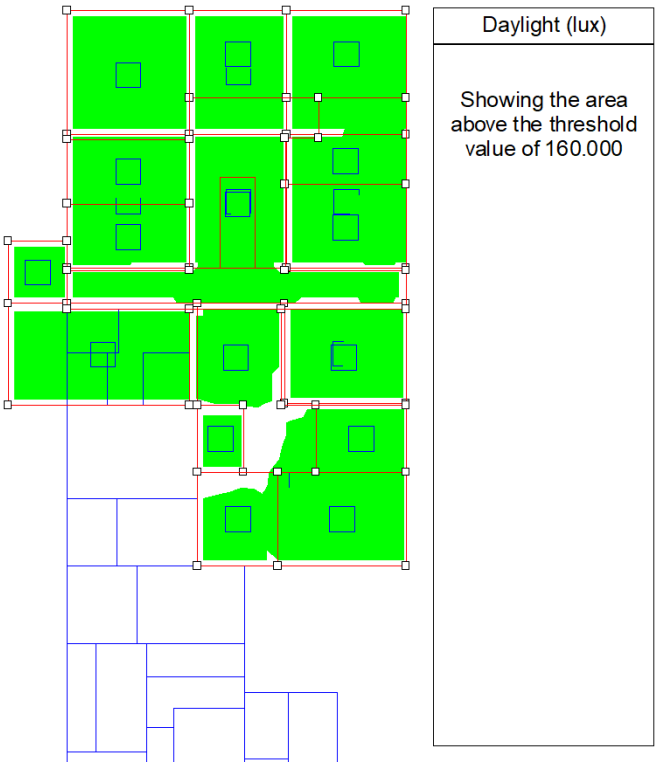
The design will be provided with adequate solar passive design and external shading to avoid glare onto work surfaces for more than 80% of the working time for each space and façade.

Above **70%** of the nominated floor areas have been designed to high levels of daylight during hours of occupancy.

6.2.1 ROTUNDA

PRIMARY SPACE FLOOR AREA TOTAL (M^2)	PRIMARY FLOOR AREA ABOVE THRESHOLD (M^2)	PERCENTAGE FLOOR AREA ABOVE THRESHOLD	AREA WEIGHTED AVERAGE DAYLIGHT FACTOR
533.17	396.50	**74.4**	10.2

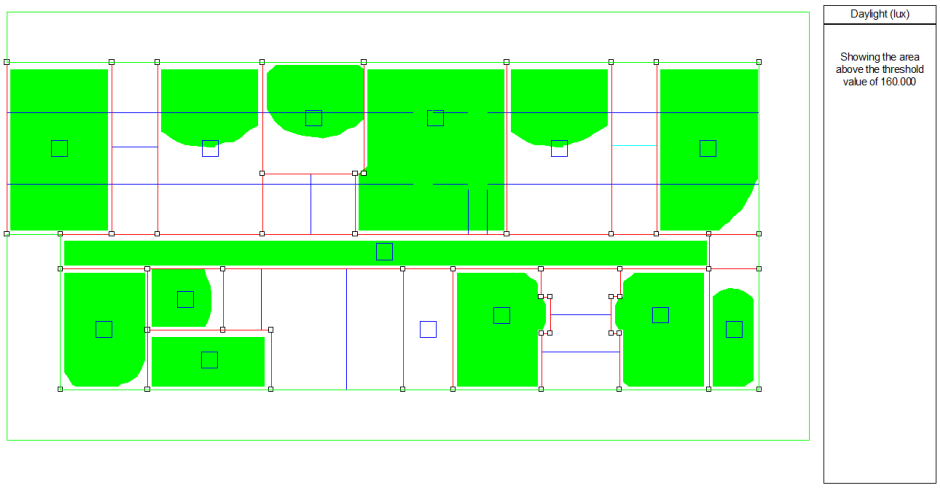
Table 18 Daylight Factor Calculations



6.2.2 CHILDCARE

PRIMARY SPACE FLOOR AREA TOTAL (M^2)	PRIMARY FLOOR AREA ABOVE THRESHOLD (M^2)	PERCENTAGE FLOOR AREA ABOVE THRESHOLD	AREA WEIGHTED AVERAGE DAYLIGHT FACTOR
726.11	586.72	**80.8**	7.3

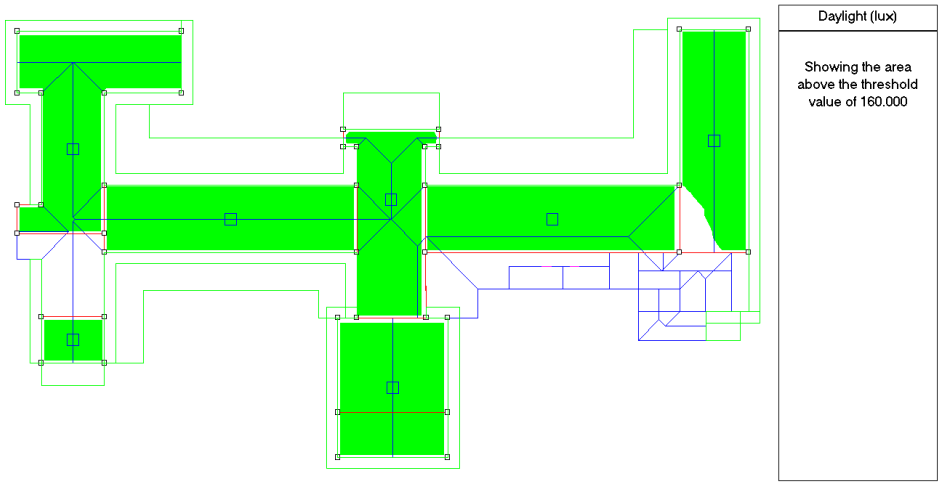
Table 19 Daylight Factor Calculations



6.2.3 MILDRED CREAK

PRIMARY SPACE FLOOR AREA TOTAL (M^2)	PRIMARY FLOOR AREA ABOVE THRESHOLD (M^2)	PERCENTAGE FLOOR AREA ABOVE THRESHOLD	AREA WEIGHTED AVERAGE DAYLIGHT FACTOR
767.3	752.5	**98.1**	12.6

Table 20 Daylight Factor Calculations



7 LIGHTING COMFORT

Lighting within the building must meet the following criteria:

- All lighting must be flicker-free.
- Light sources must have a minimum Colour Rendering Index (CRI) average R1 to R8 of 85 or higher and have a CRI R9 of 50 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 series applicable to the project type and including maintenance.
- 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.; and
- All light sources must have a minimum of 3 MacAdam Ellipses.
- The walls within the field of view of occupants in regularly occupied spaces must have an average surface reflectance value of 0.70 and an average surface illuminance of at least 50% of the horizontal illuminance levels required for task.
- Vertical illuminance in workspaces: ensure that 50% of the horizontal task illuminance reaches the average eye height for 90% of primary spaces using vertical illuminance calculation grid.
- The illuminance values must be calculated in accordance with AS/NZS 1680 series for the relevant task.

7.1 EFFICIENT LIGHTING AND CONTROL

The installed aggregate illumination power has been designed to be **20%** below the maximum illumination power based on maximum allowable lighting power densities defined in Table J6.2a of the NCC 2019. Motion Detectors and daylight sensors are provided to reduce demand.

Table 22 Lighting Characteristics

PARAMETER	PROPOSED BUILDING	REFERENCE BUILDING
LIGHTING TYPE	LED light fittings	LED light fittings
DESIGN ILLUMINANCE (LUX)	Various lux	Various lux
NOMINAL LIGHTING POWER DENSITY (W/M^2)	**20%** less compared to NCC max requirements.	As per NCC max requirements.
OCCUPANT SENSOR CONTROLS	Motion sensors	N/A
DAYLIGHT CONTROLS	Yes	N/A
OTHER LIGHTING CONTROLS	Timer switches	N/A
ADJUSTMENT FACTOR APPLIED	0.9 – Motion sensor 1 0.7 – Motion sensor 2 0.55 – Motion sensor 3	Room Aspect Ratio

8 WATER EFFICIENCY

8.1 PESCRITIVE WELS RATING

All new water services are to ensure that high WELS rating fixtures and fitting are to be installed as appropriate.

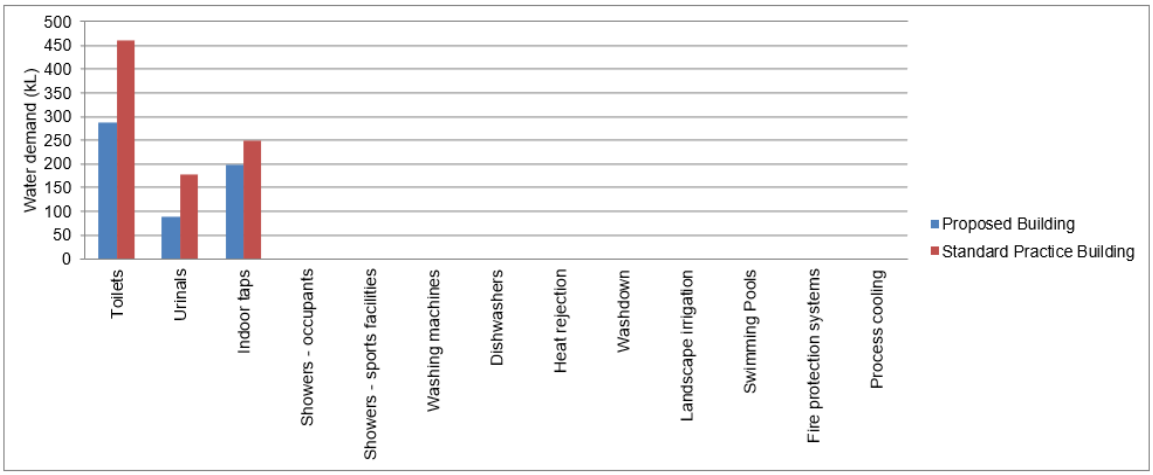
Table 23 WELS Ratings

FIXTURE / EQUIPMENT TYPE	WELS RATING
TAPS	5 Star
TOILETS	5 Star
URINALS	5 Star

Table 24 Estimated Water Use

FITTINGS	PROPOSED BUILDING WATER DEMAND (KL/YEAR)	STANDARD PRACTICE BUILDING WATER DEMAND (KL/YEAR)
TOILETS	409	655
URINALS	126	252
INDOOR TAPS	283	354
REDUCTION	**35.0%**	

Table 25 Estimated Water Use



9 MOVEMENT AND PLACE

9.1 BICYLCE PARKING FACILITIES & SUSTAINABLE TRANSPORT FACILITIES

It is the intention of this category to reduce occupant's dependency on private vehicle usage. This is achieved by providing alternatives methods of transport and provide a high level of amenity in the surrounding vicinity. The development will provide bicycle storage facilities at all entry points to the park and heritage site. Additionally, will provide infrastructure to allow the future installation of EV charging stations to 5% of carparking bays.

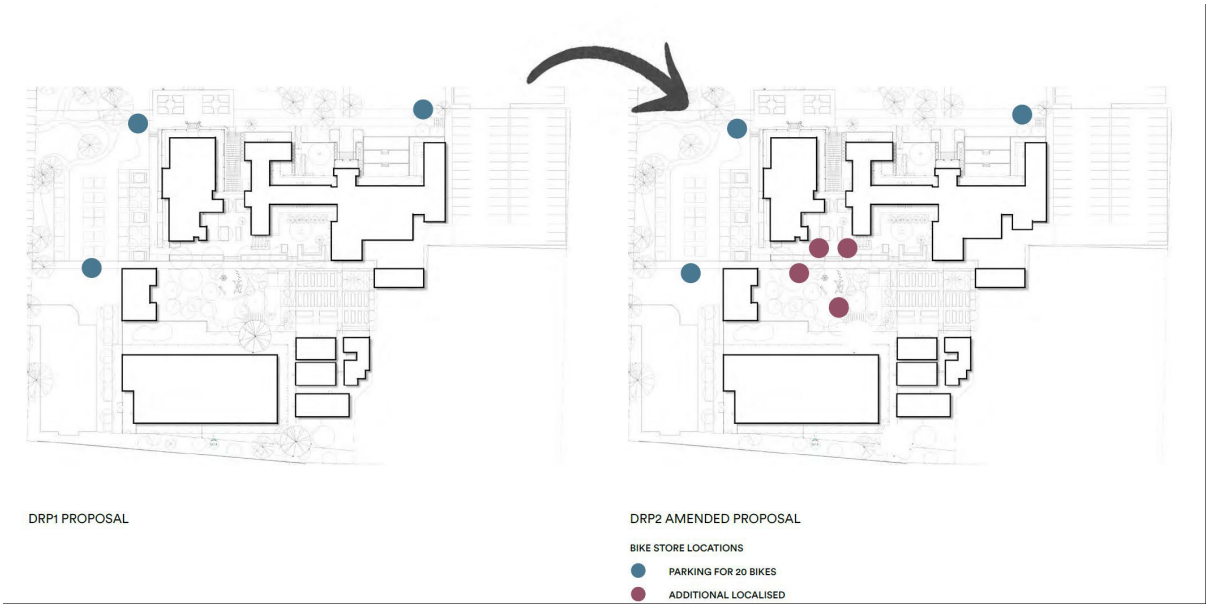


Figure 13: Bike racks

10 LAND USE AND ECOLOGY

10.1 HEAT ISLAND EFFECT

The project will dedicate more than **60%** of the entire site area to include one or a combination of the following:

- Vegetation.
- Roofing materials, including shading structures, having the following:
  - For roof pitched <15°– a three-year SRI of minimum 64; or
  - For roof pitched >15°– a three-year SRI of minimum 34.
- Only where the three-year Solar Reflectance Index (SRI) for products is not available, use the following:
  - For roof pitched <15° – an initial SRI of minimum 82; or
  - For roof pitched >15° – an initial SRI of minimum 39.
- 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 or roof structures, including solar hot water panels and photovoltaic panels.

11 BIODIVERSITY ENHANCEMENT

Landscaping should consist of native vegetation with crop coefficient of 0.5 or below. All landscaping irrigation to include drip irrigation and include moisture sensor override or alternatively the use of Xeriscape Garden. Where Xeriscape Garden is implemented, there will be a provision for the removal of irrigation within three months of landscaping installation reducing the need for watering after. Water for landscaping will be from non-portable sources (where available).

12 WASTE EFFICIENCY

A waste planning expert will produce a Waste Management Plan (OWMP) that addresses best practice in waste management, including:

- Identifying the objectives of the plan, by setting diversion from landfill targets and / or target for reducing total materials generation (general waste materials + recyclable / reusable materials);
- Clearly identify waste streams including general waste, paper and cardboard, glass and plastic;
- Clearly identify applicable bins for various waste streams, that allow for separation of recyclable streams – or use of comingled systems where appropriate.
- Clearly identify at least one other waste stream that can be recycled, and for which recycling facilities are provided.
- Clearly identify storage areas for all waste streams identified in the OWMP.
    - Area to be sized sufficiently for all streams nominated above, based on waste generated by the project and the collection frequency for each stream; and
    - Calculations shall be based on third-party best practice guidelines.
- Outline best practice access requirements for the collection of all waste streams identified in the OWMP.
- Outline individual roles responsible for delivering and reviewing the OWMP

13 CIRCULAR ECONOMY

Within the Edward Millen Reserve Precinct project, the project team have dedicated to integrating on-site production in harmony with the circular economy ethos. This vision entails the cultivation of food, its consumption, and the repurposing of waste, all taking place within the immediate vicinity of the Edward Millen Reserve Precinct community. This localised approach not only fosters sustainability but also enhances the resilience and self-sufficiency of this unique precinct.

14 EXPOSURE TO TOXINS

14.1 PAINTS, ADHESIVES, SEALANTS AND CARPETS

To meet the requirements, at least 95% of internally applied paints, adhesives, sealants (by volume), and carpets (by area) must meet TVOC (Total Volatile Organic Compounds) limits. Compliance with these limits can be achieved through one of the following methods:

1. Product Certification Scheme: The contractor can use products that are certified under a recognized and current Product Certification Scheme at the time of purchase. These schemes assess and verify the TVOC content of the materials, ensuring they meet the specified limits.
2. Laboratory Product Testing: If there are no certified products available, the contractor can conduct laboratory testing on the paints, adhesives, sealants, and carpets to determine their TVOC content. The testing should be carried out using the whole paint, including water and tinters, to obtain accurate results.
3. Absence of Non-compliant Materials: Alternatively, if none of the materials mentioned (paints, adhesives, sealants, and carpets) are present at the time of practical completion (PC), and thus no TVOC emissions are expected, compliance can be achieved.

All paints used for internal application on the job are to have a low TVOC content as outlined below. TVOC content must be based on whole paint (water and tinters included):

Table 26 Paint VOC limits

PRODUCT TYPE / SUBCATEGORY	MAX TVOC CONTENT (G/L OF READY TO USE PRODUCT)
Walls and ceilings – Any gloss level	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65

Maximum TVOC Content Limits for Paints, Varnishes and Protective Coatings
*EU Directive
The TVOC content of the 'ready-to-use' paint shall be theoretically calculated as the sum total of the VOCs of each of the raw material component comprising the paint.

Where the TVOC content of individual components is not known, it must be determined experimentally by one of the following testing methods as appropriate:

- ISO Method 17895 (2005), for a material with a presumed VOC content <1%;
- ISO Method 11890-2 (2006), for a material with a presumed VOC <15%;
- ISO Method 11890-1 (2007), for a material with a presumed VOC content >15%;
- ASTM D3960, which is comprised of four individual testing procedures that measures TVOC (D2369) as well as density (D1475) and water content (D4017). Exempt compounds (D4457) must not be subtracted in the calculation of VOC content.

The contractor must obtain written approval from the design team before using any sealant, adhesive, paint, flooring or fit out items. This approval will be contingent on the provision of proof that the product has a VOC content below that noted above.

At the end of construction, the contractor is required to undertake a final audit to ensure that the correct products have been used.

All sealants used in an internal application on the job are to have a low TVOC content as outlined below.

Table 27 Adhesives/Sealants VOC limits

PRODUCT	MAXIMUM TVOC CONTENT (G/LITRE)
General purpose adhesives and sealants	50
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
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140

Maximum TVOC limits for Adhesives & Sealants
*Sealants used to enhance the fire- and water-proofing properties are included.

The testing method applicable to adhesive and sealants is only ASTM D3960 as detailed above for paints. For more information on ASTM D3960 refer to South Coast Air Quality Management District Rule 1168.

The contractor must obtain written approval from the design team before using any sealant, adhesive, paint, flooring or fitout items. This approval will be contingent on the provision of proof that the product has a VOC content below that noted above.

At the end of construction, the contractor is required to undertake a final audit to ensure that the correct products have been used.

All carpets and/or other flooring used on the project are to have low TVOC emission rates as outlined below.

Table 28 Carpet VOC limits

ALL CARPET/FLOORING PRODUCTS MUST COMPLY WITH TVOC EMISSION LEVELS	
Total VOC limit	0.5 mg/m^2 per hour
4-pc (4-Phenolcycohexene) limit	0.05 mg/m^2 per hour

Compliance Testing: Refer to Carpet and Rug Institute Green Label (US) OR American Society for Testing and Materials (ASTM) D5116 Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Material/Products OR

For carpets and laminate floor coverings, an option for demonstrating compliance with TVOC levels is as follows: ISO 10580 (also known as ISO/TC 219) – Document N238 – Resilient,

Textile and Laminate Floor Coverings Evaluation of Volatile Organic Compounds Emissions, with a limit of 500µg/m^2/hr at 24 hours. OR

For floor coverings (other than carpet), an option for demonstrating compliance with TVOC levels is as follows:

ISO16000 parts 9, 10 and 11 (also known as the EN 13419), with a TVOC limit at three days of 5mg/m²/h and 0.5mg/m²/h at 28 days.

Carpet or other flooring installed as part of the base building works prior to fit out works, can be deemed re-used for the purpose of this credit.

The contractor must obtain written approval from the design team before using any sealant, adhesive, paint, flooring or fit out items. This approval will be contingent on the provision of proof that the product has a VOC content below that noted above.

At the end of construction, the contractor is required to undertake a final audit to ensure that the correct products have been used.

There are two options for demonstrating compliance for carpets, as follows:

Option A - Product Certification:

Carpets certified under a relevant Product Certification Scheme standard recognised by the GBCA under the GBCA assessment Framework for Product Certification Schemes are deemed to satisfy the requirements of this criterion. Relevant GBCA recognized standards are listed on the GBCA web site. The certificate must be current at the time of project registration or submission and list the relevant product name and model.

A UL GREENGUARD Children & Schools® certification current at the time of project registration or submission is another acceptable evidence for demonstrating compliant TVOC levels for carpets.

Option B - Experimental Testing

All carpets comply with the Total VOC (TVOC) limits within Table below. The emission levels detailed in this table must be established by a NATA or another ISO/IEC17025 accreditation laboratory.

Table 29 Flooring VOC limits

ALL CARPET/FLOORING PRODUCTS MUST COMPLY WITH TVOC EMISSION LEVELS – TO ASTM D5116 TEST PROTOCOL	
Carpets using ASTM D5116 Test Protocol:	
Total VOC limit	0.5 mg/m^2 per hour
4-pc (4-Phenolcycohexene) limit	0.05 mg/m^2 per hour
Carpet using ISO 16000 test protocol (also known as EN 13419)	
TVOC at three days-	0.5 mg/sqm per hour
Flooring using ISO 10580 (also known as ISO/TC 219) – Document	
TVOC at 24 hours - 0	0.5mg/sqm per hour

14.2 FORMALDEHYDE MINIMISATION

All engineered wood products used internally, including exposed and concealed applications, must have low formaldehyde emissions as defined in the table below, or contain no formaldehyde. Engineered wood products are defined as particleboard, plywood, veneer, MDF, Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels and include both finished and unfinished products.

These requirements are not applicable to exterior applications, formwork, internal car park applications, reused engineered wood products or raw timber.

The contractor must obtain approval from the design team before substituting any product.

The limits listed here are defined according to the test method. The levels listed are equivalent results for different test procedures.

Table 30 Formaldehyde emission limits

TEST PROTOCOL	EMISSION LIMIT/ UNIT OF MEASUREMENTS
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	< 1.0 mg/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	< 1.0 mg/L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	< 1.0 mg/L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	< 1.0 mg/L
JIS A1901 (not applicable to Plywood)	< 1.0 mg/L
ASTM D5116	<0.1 (+/- 0.0005) mg/m²hr (may also be represented as mg/m²/hr)
ISO 16000 part 9, 10 and 11 (also known as EN 13419)	<0.1 (+/- 0.0005) mg/m²hr (may also be represented as mg/m²/hr)
ASTM D6007	0.12mg/m³*
ASTM E1333	0.12mg/m³**
EN 717-1 (also known as DIN EN 717-1)	0.12 mg/m³
EN 717-2 (also known as DIN EN 717-2)	3.5 mg/m²hr (may also be represented as mg/m²/hr).

*The test report must confirm that the conditions of Table 1 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

** The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

15 CONCLUSION

In conclusion, the presented report provides a comprehensive overview of sustainability commitments that harmonize seamlessly with the core principles of the sustainability philosophy. These initiatives centre around the critical areas of energy conservation, water conservation, and waste reduction, showcasing a concerted effort to create a more environmentally responsible and resource-efficient approach. By prioritising these fundamental aspects, the report underscores a commitment to fostering a greener and more sustainable future.

Table 31 – Sustainability Commitments

DESCRIPTION	GOAL	SUSTAINABILITY COMMITMENTS
CLEAR AIR	Improve indoor environment quality and health and wellbeing of occupants.	Outdoor air provided to primary areas at a rate at least **50%** greater than minimum in AS 1668.2:2012. *(TBC based on mechanical consultant).*
LIGHT QUALITY		Above **70%** of the regularly occupied areas have high level of daylight (above 160 Lux).
EXPOSURE TO TOXINS		The building's paints adhesives, sealants, and carpets are low in TVOC or non-toxic. The building's engineered wood products are low in TVOC or non-toxic. Occupants are not exposed to banned or highly toxic materials in the building.
HEAT RESILIENCE	Reduce impacts of long-term performance.	Large areas of vegetation on site (community farmers market, parkland lawn, lawn terraces and garden pavilion). Approx **60%** of whole site dedicated to lowering Heat Island Effect
UPFRONT CARBON	Reduce carbon footprint	Approx **60%** reduction in upfront carbon for re-use of existing heritage building.
CIRCULAR ECONOMY	Resources	On-site production at the core, aligning with the circular economy ethos. This means that food is grown, consumed, and waste is repurposed locally.
ENERGY USE	Reduce emissions and water use.	A minimum of **30%** offset in operational energy usage for each building (no battery installed). We have also outlined options for a **50%** offset (pending budget).
WATER USE		Prescriptive High WELS Ratings (these equal a **35%** reduction in potable water).
LIGHTING USE		**20%** reduction in lighting power when compared to NCC
MOVEMENT AND PLACE	Low carbon options.	Bike parking provided. **5%** of carparking bays dedicated to EV's/
DESIGN FOR INCLUSION	Social Health	Gender Neutral Toilets *(subject to tenant requirements)* Giving priority to produce grown onsite and used in the precinct kitchen, bakery and childcare.

CULTURE, HERITAGE, AND IDENTITY	Cultural Centre	A museum/gallery will be located in the Mildred Creak building, and indigenous art will be incorporated into the park and our heritage development. Further details will be finalised in the next 2-3 months.
	Indigenous Inclusion	planning a walking trail that commences in the parklands, traverses our site, and ultimately connects to the adjacent Bush Forever site to the southeast.
BIODIVERSITY ENHANCEMENT	Improved Nature outcomes.	Enhance shade by planting more native trees locally, aligning with climate resilience and native plant preservation. The precinct's kitchens will recycle organic waste, using it for compost in vegetable gardens or as feed for on-site small-scale livestock like chickens and goats.