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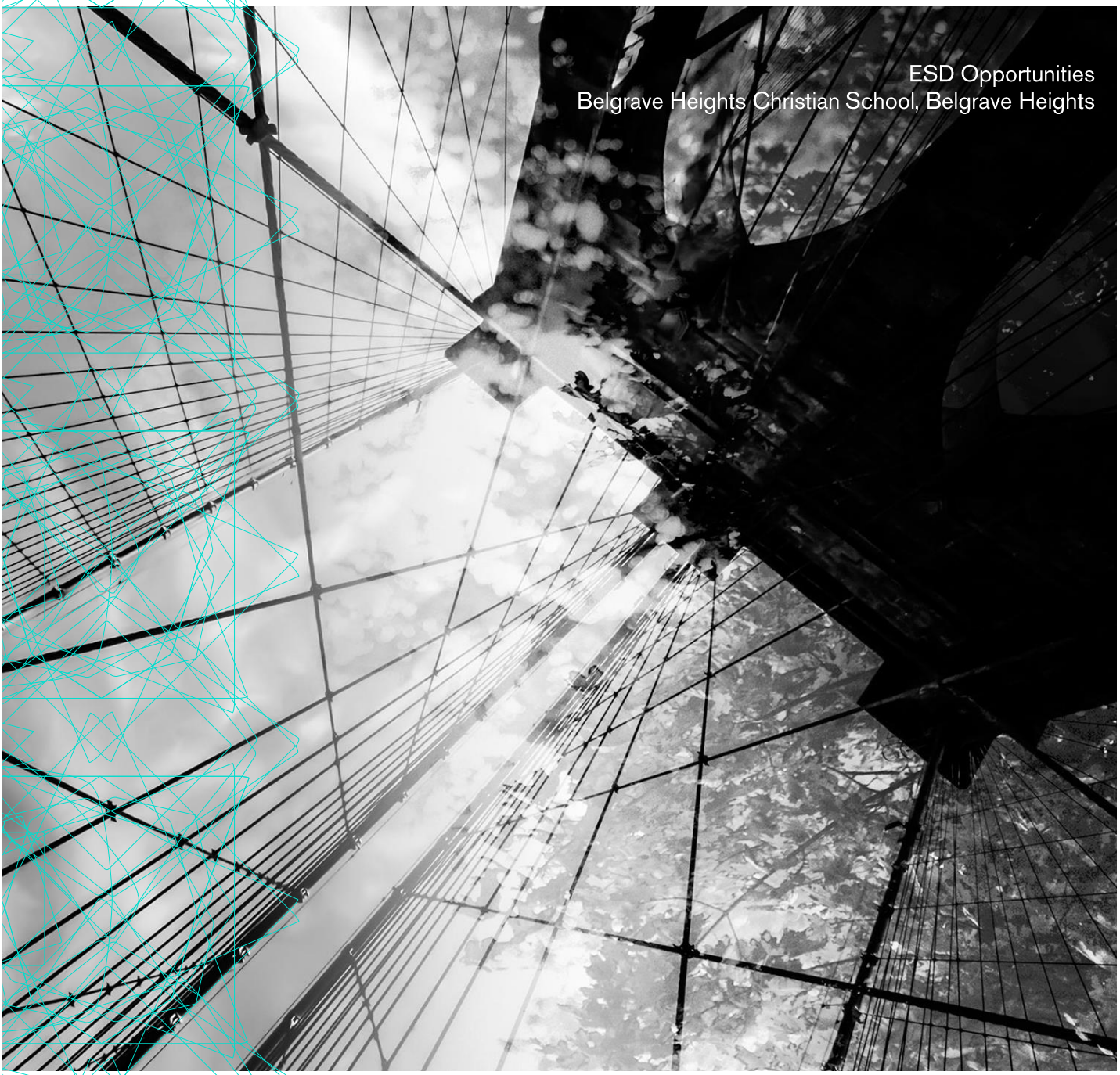

ESD Opportunities
Belgrave Heights Christian School, Belgrave Heights

SUSTAINABLE DEVELOPMENT
_CONSULTANTS

Proposed School Expansion
Belgrave Heights Christian School, 20 Wattle Valley Road, Belgrave

ESD Opportunities

June 2024

S4758 ESD Opp.V2

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1. Introduction

This Environmentally Sustainable Design (ESD) opportunities document has been prepared to assist the design, construction and operation of the proposed development at Belgrave Heights Christian School in Belgrave, comprising of a senior learning centre.

Sustainable Development Consultants have assessed the proposed development application plans and provided input to the design team. This ESD Opportunities document proposes initiatives that are intended to improve the building's overall sustainability performance, while also ensuring that the development addresses the sustainability requirements of the Yarra Ranges Shire.

This document has been prepared by Sustainable Development Consultants with reference to the architectural Development Application drawings prepared by Smith + Tracey Architects.

1.1 Site Description

Belgrave Heights Christian School is located at 20 Wattle Valley Road, Belgrave. The school is located approximately 36kms west of the Melbourne CBD and is 1.4kms from the Belgrave Railway Station and town centre. The site is currently developed with existing school buildings, and the proposed building will be situated on a portion of undeveloped land on the site.

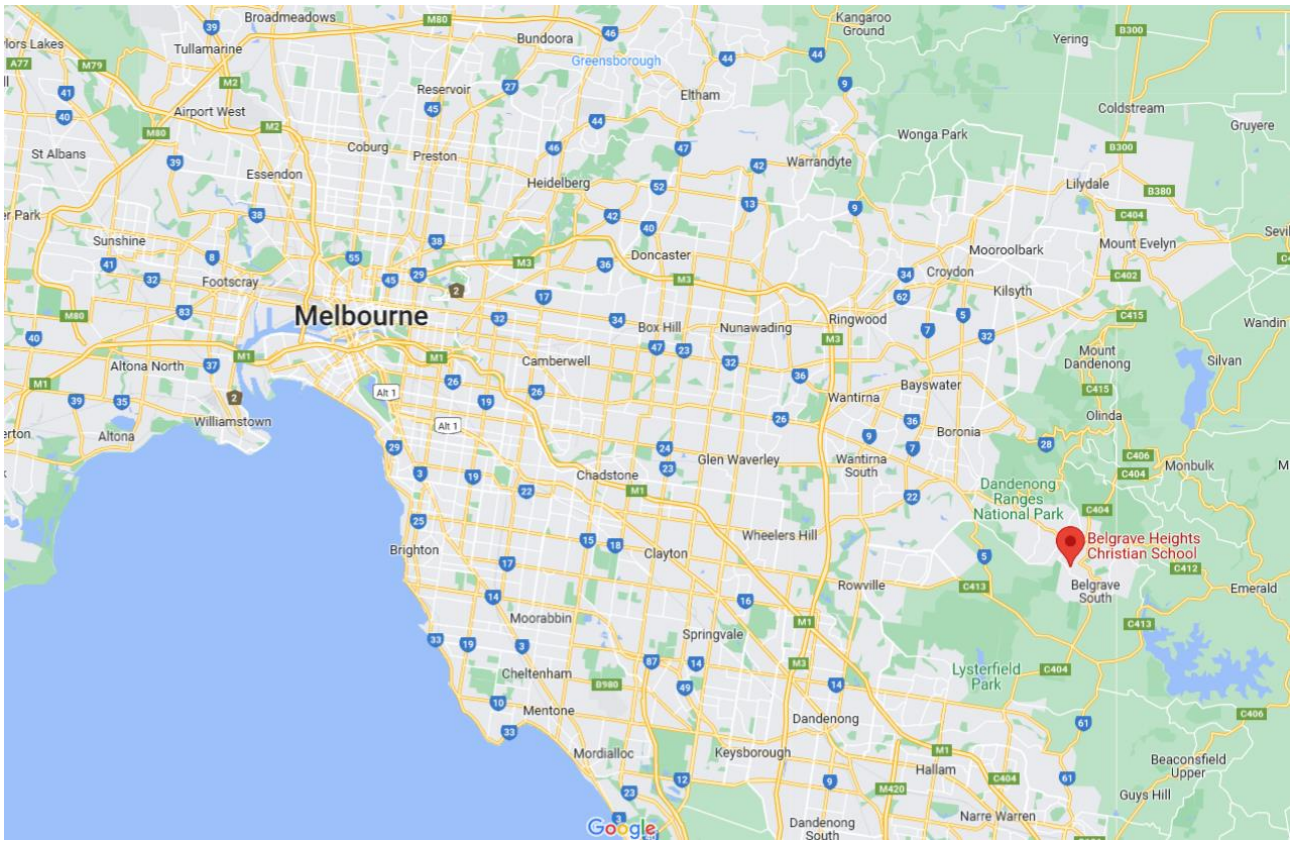

Figure 1: Location of Belgrave Heights Christian School, Belgrave Heights (Source: Google Maps)

Version	Date of Issue	Description	Author	Approved
V1	31-10-2022	Final Report	GB	BdW
V2	04-06-2024	Updates Per Plan Revisions	AO	AR

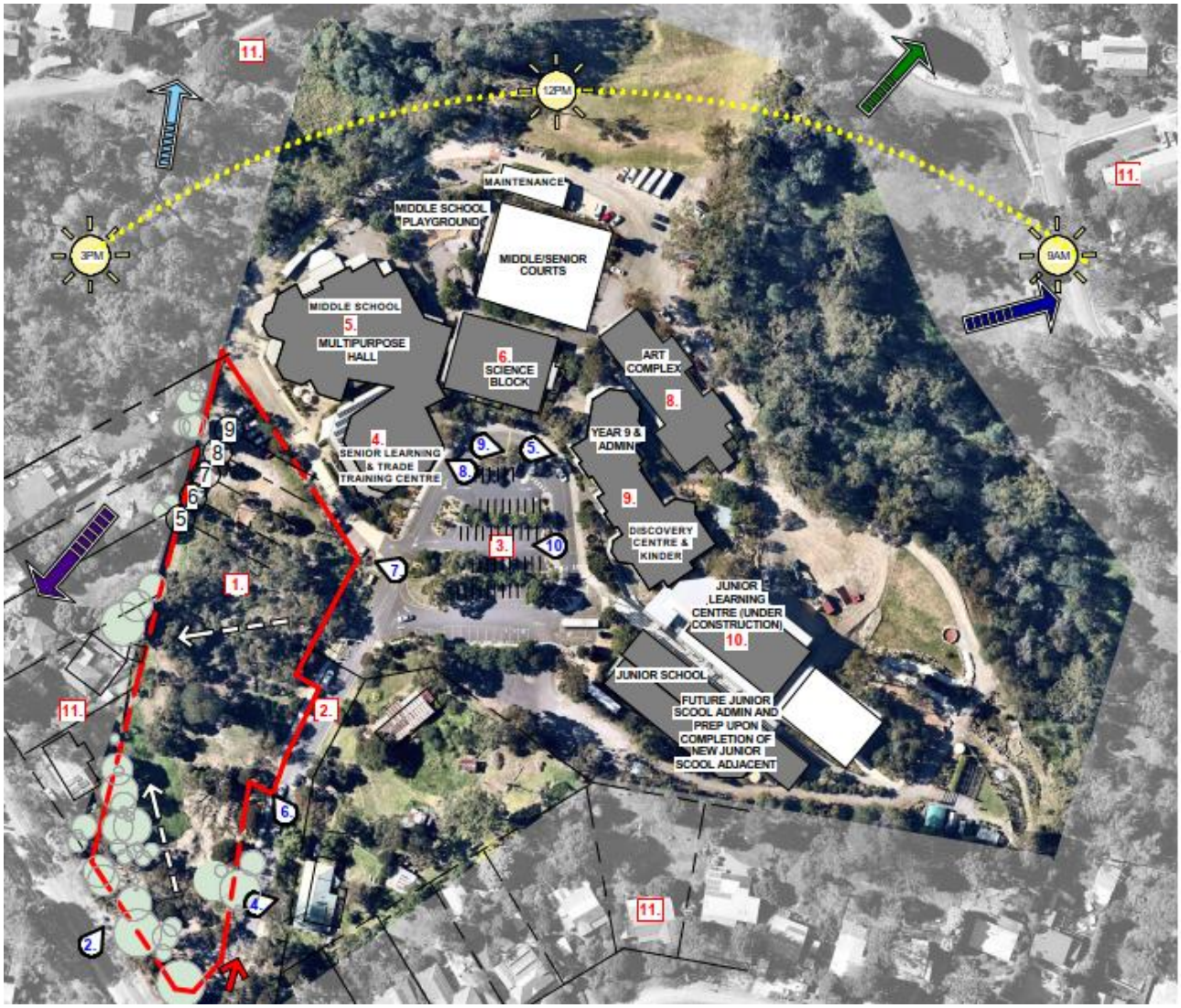

Figure 2: Local Site Context (Source: Architectural Drawings)

2. ESD Initiatives

The ESD initiatives and principles proposed for the new building at Belgrave Heights Christian School are outlined in the table below. This table includes a brief description outlining the method and benefit(s) of each initiative.

Sustainability is one of the "Distinctives" held by the Belgrave Heights Christian School. Another is innovation. Accordingly, our intent is that the project includes initiatives that deliver very significant sustainability outcomes. This is underpinned by the school's willingness to embrace new ideas.

The Yarra Ranges Council has also expressed a strong commitment to environmental sustainability and seeks to be a leader in sustainability and environmental best practice.

The purpose of this paper is to "tease out" what this could mean for the type and scale of sustainability initiatives that could be included in any new building development at Belgrave Heights Christian School. It is also our intention to:

- Focus on sustainability initiatives that are affordable and offer clear benefits to the school, staff and students;
- Consider the practicality of sustainability initiatives; and
- Consider the ease with which sustainability initiatives can be implemented.

ESD Initiative	Description
Electric-Only Buildings (No gas)	Greater control of greenhouse gas emissions can be exerted by not running systems and appliances off natural gas. Electricity can be 100% green power (and gas cannot be) and is therefore the preferred means of providing energy. Energy efficient electric induction cooktops can be implemented instead of gas in the kitchen. Other uses of natural gas can often be replaced by electric heat pump systems.
Energy Efficient Appliances, Systems and Fixtures	This initiative is to require/encourage the installation of appliances and fixtures which produce less greenhouse gas emissions than what is currently produced through a business-as-usual approach. This may include, but not be limited to: • Greenhouse gas efficient hot water systems (e.g. electric heat pump). • Appliances selected within one energy efficient star of the best available. • Air conditioning systems which have a higher coefficient of performance (COP) and energy efficiency ratio (EER) than is allowed under current Minimum Energy Performance Standards. The passive design strategies outlined below (effective orientation, shading, ventilation, etc.) are aimed to greatly minimise reliance of heating and cooling systems. All HVAC refrigerants used in the development will be selected to have an Ozone Depletion Potential (ODP) of zero.
Indoor Lighting	Energy consumption from artificial lighting throughout the development to be reduced by using LED lighting and optimising daylight diffusion via light-coloured internal surfaces (particularly walls, furniture and ceilings). Classrooms could be fitted with automatic controls that operate outside school times, to minimise unnecessary consumption. Installing motion sensor lights should be considered to further improve efficient building energy operation.
External Lighting	External lighting should be LED and have controls (e.g. motion detectors, and timers) to minimise consumption during off-peak times (e.g. 5pm-5am).
Energy Shut-down Switches	This involves installing electrical wiring circuitry that enables the staff to switch off all non-essential lighting, appliances, and equipment at the end of the school day, and importantly, over weekends and school holidays.
Energy Usage Monitor and Display Systems	A monitoring system displaying the energy usage within the building could be provided. Students would be able to observe energy usage within selected areas of the building, promoting energy efficient practices while developing student awareness through the interactive medium. The monitoring system would be connected to the solar PV system and rainwater collection.
Lift	The design places the lift adjacent to the stairs, making it easier for staff and students to have the choice of using the stairs. An energy efficient lift will be specified that includes measures to specifically reduce stand-by consumption such as: • Switching off control devices when the lift is not in motion & using more efficient power supply unit; • LED lights and display; and • Suspension specifically designed to reduce friction.

ESD Initiative	Description
Building Sealing	All windows, doors, exhaust fans and pipe penetrations should be constructed to minimise air leakage as required by the provisions outlined in the NCC. This would include the use of seals around operable windows and doors as well as caulking to pipe penetrations, and the addition of self-closing louvers or dampers to exhaust fans.
Solar PV System	The building provides a significant opportunity for a solar PV system to be installed. It is suggested that a minimum 50kW system be installed on the roof, however the space available could potentially accommodate a much larger system, should the school consider this. The panels should be predominantly north facing where possible to make use of the sunlight and energy generating potential during school hours. High efficiency panels (e.g. 450W) should also be preferred to limit the number of panels, as in turn material resources, required for the array.
Water Efficient Appliances, Systems and Fixtures	Efficient water fixtures and fittings should be installed to reduce the volume of mains water used. The following Water Efficiency Labelling Scheme (WELS) star ratings should be specified: • Kitchen and Bathroom taps: 6 Star; • Toilets: 4 Star; and • Showers: 3 Star (≤7.5L/min) Dishwashers should be a minimum of 5 Star WELS rated.
Rainwater Collection and Reuse	The total effective non-trafficable roof catchment area of 840m² will harvest stormwater into rainwater tank(s) with an effective storage capacity of 10,000L. Collected water will be used for toilet flushing across the building. The appropriate rainwater tank sizing has been calculated utilising the Green Star Potable Water Calculator (see Appendix 1). Having good water storage capacity will save potable water overflowing to stormwater drainage. If sending runoff from the entire roof to a rainwater tank(s) is not feasible, the development should consider installing raingardens to treat the remaining roof runoff, slowing and filtering the water before it is sent to stormwater drains. Additional water sensitive urban design (WSUD) devices such as swales, bio-retention basins and wetlands should be considered as water treatment devices where appropriate. Quantifiable best practice water quality targets could be set and verified through accepted modelling tools such as MUSIC.
Water Efficient Landscaping	Landscaping in garden beds should be drought tolerant and include mulch and soil wetting agents to reduce the potable water consumption for irrigation. Alternatively, landscaping could be designed in accordance with xeriscape principles, which emphasize drought tolerance and grouping plants with similar water demand characteristics together. If required, a sub-surface drip irrigation system with moisture sensor override will be specified. All irrigation should be via the rainwater tank.

ESD Initiative	Description
	 
Natural Light and Views	The whole development will maximise natural light infiltration, while including sun and glare control. Roofs over the outdoor classrooms could include clear panel sections and skylights could be included over the top-level classrooms to reduce lighting energy demand Access to views that connect the interiors to the surrounding context should be maximised particularly to natural views of garden.
Natural Ventilation	Natural ventilation should be the preferred ventilation for the development in preference to full reliance on Heating, Ventilation and Air-Conditioning (HVAC) systems. Natural ventilation would involve the inclusion of operable windows on multiple sides of the building, and at various levels, including operable clerestory lights which would allow air flow when external conditions are favourable throughout the development.
Ceiling Fans	Ceiling fans could be provided to classrooms, assisting to circulate larger volumes of fresh air and reducing air-conditioning demand.
Acoustics	Acoustics within the classrooms should be optimally designed to allow large groups of students to collaborate without disturbing nearby rooms.
Building Orientation	The overall building orientation and location of spaces within the building should take advantage of passive design opportunities throughout the development. The chances of the building temperature therefore being naturally comfortable will encourage use of the space throughout the year during cooler months as well as the hotter summer months. There is opportunity to provide passive, cross-flow ventilation by creating breeze-paths through learning spaces, the intended use of foldable walls will aid this. The opportunities for natural ventilation could also extend to the common room lounge and many of the General Learning Areas. The intent could be to utilise passive ventilation when external temperatures and weather conditions are suitable, and mechanically condition spaces when they are not.
Shading	The building has been designed with shading to the north, east and west sides. There is an opportunity, when modelling for energy efficiency occurs, to assess the effectiveness of shade treatments and refine these if necessary. The shading will also provide extra shelter for outside areas. Deciduous plants could be implemented along the north-eastern and north-

ESD Initiative	Description
	western elevations as shading options to allow summer shade and winter sun access.
Insulation	Ample insulation should be installed throughout the development to mitigate heat transfer through the building envelope, reducing heating and cooling requirements whilst ensuring internal comfort. Students who experience well insulated comfortable buildings will inherently understand and benefit from the value of high-quality building and efficient performance as part of their learning experience. All thermal insulation used in the development will not contain any ozone-depleting substances and will not use any in its manufacturing.
Non-toxic materials	Building a safe and healthy learning environment for all students and the broader school community will contribute to better learning environment. All paints, adhesives and sealants and flooring (including carpets) should not exceed the limits outlined in Appendix 2. Alternatively, products with no VOCs should be selected. All engineered wood products should have 'low' formaldehyde emissions, certified as E0 or better. Alternatively, products would be specified with no formaldehyde. Emissions limits are listed in Appendix 2.
Building and Construction Waste	The builder should develop a construction waste management plan (CWMP) for the construction phase. This would include the following: • Waste generation; • Any waste systems; • Minimisation Strategy; • Performance / Reduction targets; • Bin quantity and size; • Collection frequency; • Signage; and • Monitoring and reporting including frequency and method. The CWMP will include a requirement for not less than 80% of all civil works and built form construction waste to be recycled or re-used. The CWMP will require that all hazardous substances, pollutants and contaminants must be managed and disposed of in accordance with all state regulatory requirements. Where these materials are treated, or used on site, they must be in accordance with a sanctioned remediation process. The CWMP may form part of a broader Construction Environmental Management Plan (CEMP).
Waste	Dedicated bin spaces will be provided within each classroom for general waste (landfill), organic & green waste (FOGO), and commingled recyclables. This will assist to minimise the risk of food and garden waste or commingled recyclables ending up in landfill. Recycling facilities will be adjacent general waste to ensure equal convenience, but bin colouring and signage will ensure distinction between different waste streams. Appropriate disposal of waste can be a learning opportunity for students, allowing a comprehensive understanding of the importance of reducing consumption and

ESD Initiative	Description
	waste.  
Concrete, Steel and Timber	Building material initiatives help reduce the use of virgin materials and generating waste and promote the use of materials with lower embodied energy and environmental impacts. The following is specified: • A minimum of 50% of the concrete mix could contain non-potable mains water (rainwater or purchased recycled water). • Wherever possible, steel for the development could be sourced from a Responsible Steel Maker[1]. Reinforcing steel for the project could be manufactured using energy reducing processes. • All timber used in the development could be Forest Stewardship Council (FSC) or Program for the Endorsement of Forest Certification (PEFC) certified or recycled / reused.
Cables, pipes, floors and blinds	All standard uses of cables, pipes, flooring and blinds within the development should either not contain any PVC or will be sourced from a manufacturer/supplier that adheres to the Green Building Council of Australia's *Best Practice Guidelines for PVC in the Built Environment*.

[1] A Responsible Steel Maker must have facilities with a currently valid and certified ISO 14001 Environmental Management System (EMS) in place and be a member of the World Steel Association's (WSA) Climate Action Program (CAP).

ESD Initiative	Description
Flooring	All flooring could be manufactured from materials/products certified under any of the following: • Carpet Institute of Australia Limited, Environmental Certification Scheme (ECS) v1.2; • Ecospecifier GreenTag GreenRate V3.1; • Good Environmental Choice (GECA); and/or • The Institute for Market Transformation to Sustainability (MTS) Sustainable Materials Rating Technology Standard Version 4.0 – SMaRT 4.0. Alternatively, floor coverings should be durable, include some eco-preferred content, be modular and/or come from a manufacturer with a product stewardship program and ISO 14001certification.
Bicycle Parking	Secure bike parking spaces should be provided for staff and students. If bike parking is already provided at the school, it should be considered whether additional parking spaces are required.
Electric Vehicle Infrastructure	To enhance the development's ability to reduce vehicle emissions, some car parking spaces could be nominated for electric vehicle charging (and provided with charging infrastructure). This would encourage staff and visitors to consider purchasing electric vehicles by making their use more convenient. The extensive solar photovoltaic system installed could also assist in generating green electricity for these chargers.
Sensory Gardens	The landscaping surrounding the building could include a sensory garden. This would give students a quiet and enjoyable natural space outside the sports development, as well as an attractive landscaped area providing views from inside the development.
Food garden	A communal school garden with food production could be maintained to cultivate and provide sustainable food production. Students would be able to observe and partake in the garden maintenance, promoting sustainable food practices.
Reduction in Urban Heat Island Effect	To reduce the impact of urban heat island effect on the campus, lighter-coloured material surfaces could be selected wherever possible, covering at least 75% of site area. This includes the use of Colourbond Coolmax or Surfmist roof sheeting and covering hardscape zones with vegetation or light-coloured materials. The project could demonstrate that shielding from the summer sun (space for shade trees to the north, east and west), has been properly considered and addressed.

3. Conclusion

This ESD opportunities summary outlines ESD initiatives which could be implemented during the Design Development phase of the proposed Senior Learning Centre building at Belgrave Heights Christian School.

The implementation of these initiatives would not only provide social, environmental and economic benefits for Belgrave Heights Christian School, but also contribute to a culture of environmental awareness within the school community.

Appendix 1 – Rainwater Tank Calculation

In order to calculate the appropriate rainwater tank sizing, the Green Star Design & As Built (V1.3) Potable Water Calculator was utilised. The potable water demand for the building was determined based on the projected occupancy of staff and students.

Overall, it was determined that to provide potable water for toilet/urinal flushing from the entire roof area (840m^2) can be collected to a 10kL rainwater tank. This will provide a rainwater tank reliability of 50%.

GENERAL

Building occupancy, areas and operation

Space type description	Area (m²)	Peak days of operation (remaining days assumed off-peak)	Occupancy profile	Maximum design occupancy used in water use calculations (m²/person) (Enter manually OR use default)		Percentage of building users who occupy the space continually for periods greater than one hour.
				Proposed Building design occupancy (m2/person)	Default design occupancy (Not applicable for residential areas)	
Classrooms	799	5 days a week	Class 9b School	2	Please select	100%
Staff room	111	5 days a week	Class 9b School		Office (10m2/person)	100%
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
		Please Select	Please Select		Please select	
Non occupied areas		n/a	n/a			
TOTAL AREA	910					

1. SANITATION

Water demand from sanitation fixtures and fittings (Annual water demand from fixtures and fittings is calculated using assumed usage rates based on the space types and occupancies entered above. See

TOILETS

Description	Water efficiency (Enter manually OR nominate WELS Star Rating)		Water efficiency used in calculations (L/flush)	Percentage of each type	Proposed Building water demand (kL/year)	Standard Practice Building water demand (kL/year)
	Manufacturer's data (L/flush)	WELS Star Rating selection				
TOILETS		4 Star	3.5	100%		
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
<enter description>		Select star rating				
			Total	100%	657	751

URINALS

Are urinals installed?	Yes
Would urinals normally be installed in the building type?	Yes

(Note: if "No" is selected, the project team should provide justification within the short report as to why the standard practice

Urinals on auto timer

Enter average L/flush	
Enter number of urinals on autotimer	
Percentage of total number of Urinals	

Description	Water efficiency (Enter manually OR nominate WELS Star Rating)		Water efficiency used in calculations (L/min)	Percentage of each type	Proposed Building water demand (kL/year)	Standard Practice Building water demand (kL/year)
	Manufacturer's data (L/min)	WELS Star Rating selection				
Urinals		6 Star	1.0	100%		
<enter description here>		Select star rating				
<enter description here>		Select star rating				
<enter description here>		Select star rating				
<enter description here>		Select star rating				
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<enter description here>		Select star rating				
<enter description here>		Select star rating				
			Total	100%	144	289

RECLAIMED WATER

Reclaimed water sources

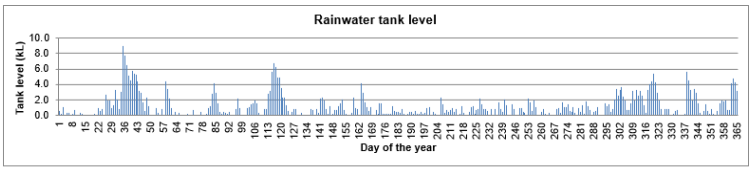
Note: All systems entered into this calculator must comply with local EPA requirements.

DISTRIBUTION OF WATER SOURCES

Water fittings / systems	Percentage of fittings/systems connected to the following water sources				
	Rainwater	Greywater	Blackwater	Stormwater recycling or other off-site reclaimed water	Mains water only (this column must be completed - enter a figure between 0% and 100% for each water system)
Toilets	100%				0%
Urinals	100%				0%
Indoor taps					
Showers - occupants					
Showers - sports					
Laundries					
Dishwashers					
Heat rejection					
Washdown					
Landscape irrigation					
Fire protection systems					
Swimming pools					
Process cooling					

Rainwater collection

Rainfall collection area (m2)		840
Run-off co-efficient	Flat roof without gravel	0.8
Storage capacity (kL)		10
Rainwater tank reliability %		50%



Appendix 2 – Green Star VOC and Formaldehyde Limits

Table 1: Maximum Volatile Organic Compound Levels for construction materials (Source: Green Building Council Australia – Green Star Buildings Submission Guidelines Version 1, 2021)

Product Type/Sub Category	Max TVOC Content (g/L of ready-to-use-product)
Paints, Adhesives and Sealants	
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
Carpets	
Total VOC limit	0.5 mg/m^2 per hour
4-PC (4-Phenylcyclohexene)	0.05mg/m^2 per hour
ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m^2 per hour
ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5 mg/m^2 per hour

Table 2: Maximum Formaldehyde levels for processed wood products. (Source: Green Building Council Australia – Green Star Buildings Submission Guidelines Version 1, 2021)

Formaldehyde emission limit values for different testing methods	
Test Method	**Emission 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^{2}hr
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m^{2}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^{2}hr (at 3 days)
ASTM D6007	≤0.12mg/m^3
ASTM E1333	≤0.12mg/m^3
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m^3
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m^{2}hr