Job Details	
Date:	1st December 2023
Project:	Sustainable Management Plan for 11 Unit Development
Client:	DeNavi Building Design
Address:	9 Janson Place, Lilydale VIC 3140
Planning No:	TBC
Assessor:	Proud Kraturerk
Job No:	230468

Revision		
A:	20th June 2023	Preliminary SDA Report
B:	31st July 2023	SDA Report
C:	1st August 2023	SMP Report
D:	11th August 2023	Amended SMP Report – 6.5 Star
E:	27th November 2023	Amendment per updated plan
F:	1st December 2023	Minor amendments

w: www.passivenergy.com.au **e**: info@passivenergy.com.au
p: 1300 248 348 **a:** Suite 9, 214 Bay Street, Brighton 3186

Introduction

The Subject site is located at 9 Janson Place. The plans prepared by DeNavi building design proposes 11 double storey units. The site has a total area of 3,703.45m2 and is orientated west to east and has minimal wall on boundary construction. The driveways are proposed to the west of the development.

The following report is to be read in conjunction with the following documents.

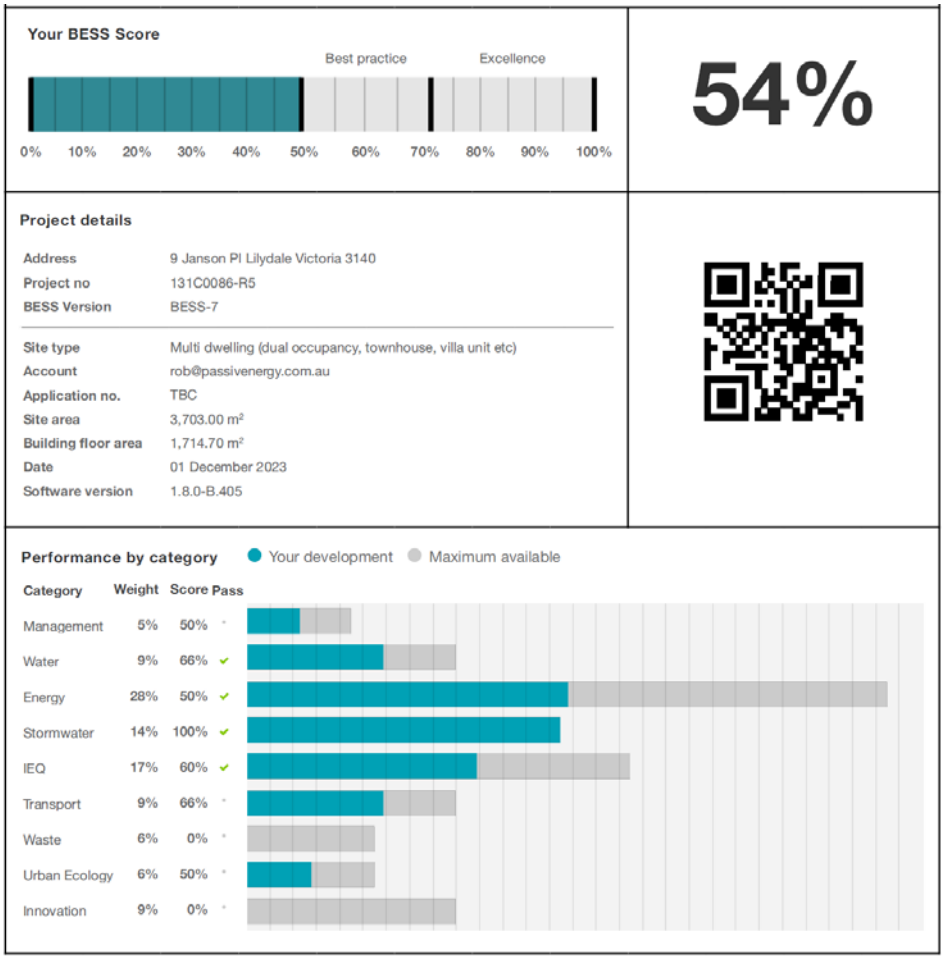
- BESS assessment
- NatHERs ratings
- STORM assessment
- Walk score

BESS Assessment (Project number **131C0086**)

The BESS (Built Environment Sustainable Scorecard) V3, 1.7 was used to assess

- Water
- Energy
- Stormwater
- Indoor Environment Quality (IEQ)
- Transport
- Waste
- Urban Ecology &
- Innovation

Following is a list of initiatives inputted into the scorecard to achieve a best practice score of 54%



Water requirements

Objectives

- To improve water efficiency.
- To reduce total operating potable water use.
- To encourage the collection and reuse of stormwater.
- To encourage the appropriate use of alternative water sources (eg. Grey water)

Initiatives

- 3000L water tank connect to each unit roof area.
- Rainwater tanks connected to toilet flushing, laundry taps.
- Water efficient landscaping. A landscape plan prepared by a suitable landscape architect to nominate water efficient vegetation throughout the development.
- For outdoor water reductions, plants, shrubs and lawn which require low amounts of water (drought-resistance) should be chosen. Native plants will be selected as they use less water and are more resistant to local plant diseases. Plant slopes with plants that will retain water and help reduce runoff.
- Group plants according to their watering needs.
- Mulch will slow evaporation of moisture while discouraging weed growth. Adding 2 - 4 inches of organic material such as compost or bark mulch will increase the ability of the soil to retain moisture.
- Shower heads to be 4 Star WELS rating(>6.0L/min but <= 7.5L/min).
- Kitchen taps to be 5 Star WELS rating.
- Bathroom taps to be 5 Star WELS rating.
- Toilets to be 4 Star WELS rating.

Energy

Objectives

- To improve the efficient use of energy, by ensuring development demonstrates design potential for ESD initiatives.

Initiatives

- Each dwelling will achieve a minimum 6.5 star energy rating.
- Internal lighting will achieve a maximum 4watts/m2.
- LED lighting fixtures will be considered for alternatives to fluorescent fittings to reduce energy consumption.
- External lighting will be controlled by motion sensors.
- Nominated heating and cooling systems will be 4 stars or within 1 star of the best relevant system in the market.
- Nominated gas instantaneous hot water system to be at least 5 star rating.

Stormwater

Objectives

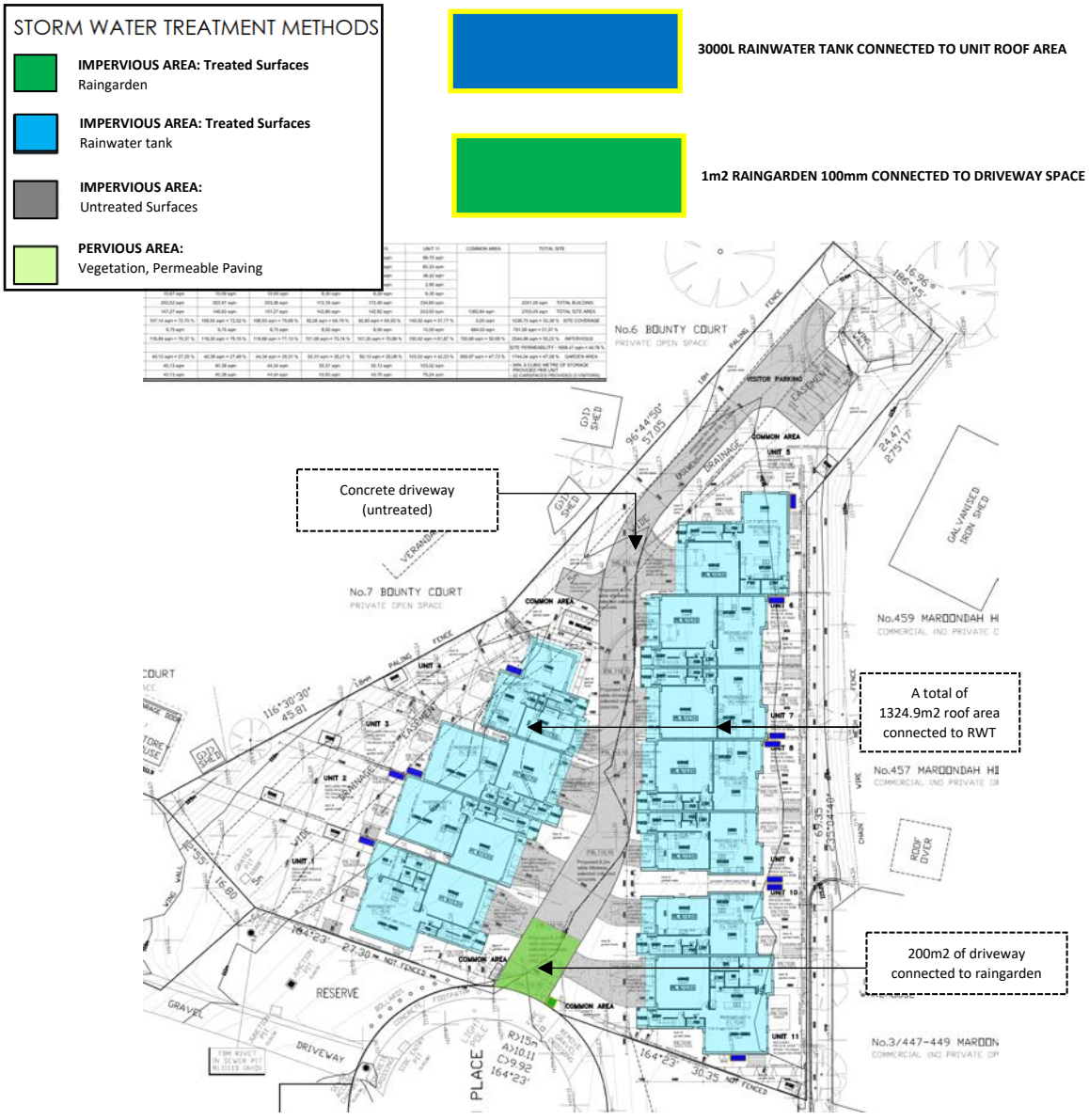
- To reduce the impact of stormwater run-off.
- To improve the water quality of the water run-off.
- To achieve best practice stormwater quality outcomes.
- To incorporate the use of water sensitive urban design, including storm water re-use.

Initiatives

A Stormwater Treatment Objective- Relative Measure (STORM) calculator was used to produce a 101% outcome.

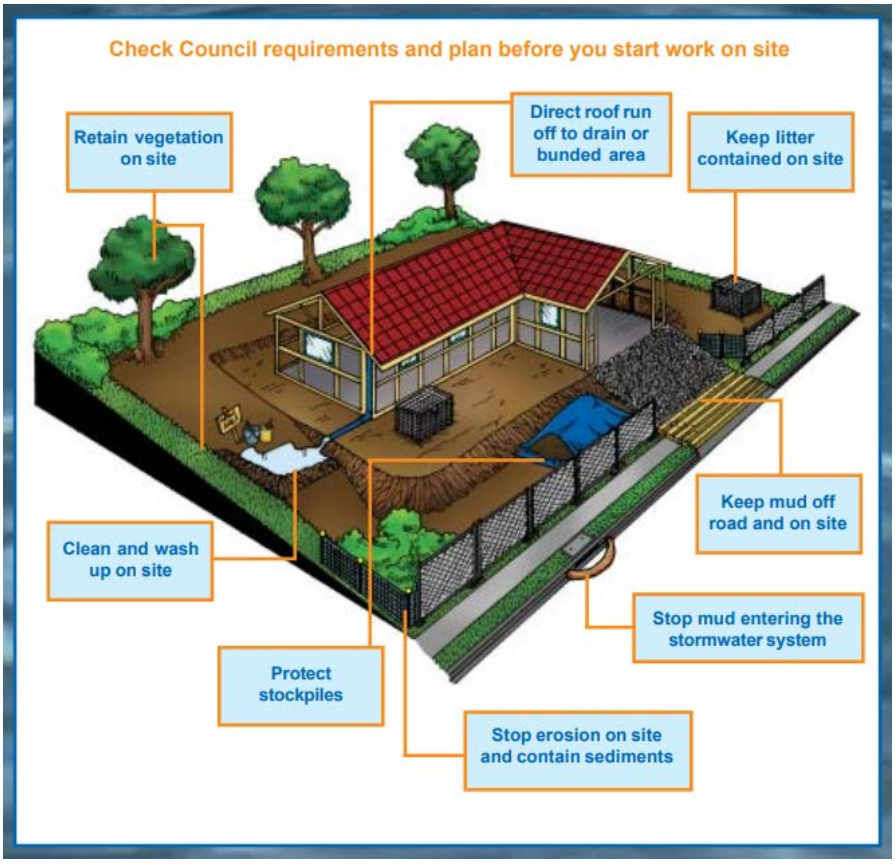
- 50m2 of the driveway space will be connected to 1m^2 of raingarden.
- Each unit will require:
    - 3000 litre water tanks connected to roof space each.
- Each unit is connected to a 3000 litre rainwater tank, which will be connected to the toilets, laundry taps.

Indicative Stormwater Treatment Plan



Note: Plan is indicative only and final locations of treatment systems and roof catchment area is subject to civil engineering.

Stormwater Site Management Initiatives



Sourced from: Keeping our Stormwater Clean – A Builder's Guide, Melbourne Water.

<u>6 Site Rules To Keep The Stormwater Clean:</u>

1. Check council requirements and plan before you start work on site.
2. Stop erosion onsite and contain sediments.
3. Protect stockpiles.
4. Keep mud off road and on site.
5. Keep litter contained on site.
6. Clean and wash up on site.

The methods and processes specified in "Keeping our Stormwater Clean – A Builder's Guide, developed by Melbourne Water will be adhered to by the builder/developer for managing the construction site.

Rain Garden Maintenance

- To operate successfully, the plants in a rain garden system need to be well-established and dense.
- The plants need to be grouped close together so any runoff water will flood or seep through, rather than establishing little flow channels (known as rills) which may erode the surface. Mulch should prevent erosion.
- Maintaining the health and density of vegetation is vital, particularly in the early stages. High density planting will also ensure a uniform root zone in rain garden systems.
- New planting will need to be maintained for at least 6 months. Tasks include regular watering, weeding, replacing dead plants, monitoring and controlling pests, and removing rubbish.
- Any scour at inlets needs to be monitored closely. Litter, debris and sediment can build up at inlet points. Litter and debris also need to be removed from surcharge pits.
- Check overflow pits for structural faults. Check the pits are functioning properly.
- If the filtration capacity is reduced significantly, the filter material should be replaced, along with new plans and mulch.

Source: EPA Victoria: Maintaining water sensitive urban design elements

Rain Garden Schedule

Component	Key activities	Typical frequency
Filter Media	– Remove leaf litter and gross pollutants – Check for biofilms (algal biofilms may develop on the surface of the filter media leading to clogging issues) – Monitor ponding of water following rainfall events – Check for permanently boggy/pooled areas	3 months & following storm events
	– Remove sediment (or scarify filter media surface if required)	Annually
Erosion	– Check for erosion/scouring – Check for evidence of preferential flow paths – Replace filter media in eroded areas – Add rock protection around inlets (if required)	3 months
Mulch	– Check depth and even distribution of mulch – Check mulch is not touching plant stems – Check for sediment/silt accumulation in mulch layer – Replace mulch (if required) – Retain mulch using jute mats or nets (if required)	3 months
Vegetation	– Inspect plant health and cover – Replace dead plants (maintain a consistent vegetation density of 6–10 plants per square metre across the raingarden filter media) – Remove weeds (avoid use of herbicides) – Prune plants (where applicable) – Water plants (if required during establishment phase)	3 months
Civil components	– Check infrastructure for damage and repair as required – Ensure inlet and outlet points are clear of sediment, litter and debris	3 months & following storm events

	– Inspection opening for underdrain (slotted drainage pipe):
	  – Check water level
	  – Check for sediment accumulation
	  – Flush the underdrain system (if required)
		Annually

For additional inspection and maintenance schedule for building managers, refer **Appendix C**

Indoor Environment Quality (IEQ)

Objectives

- To achieve a healthy indoor environment quality for the wellbeing of building occupants, including the provision of fresh air intake, cross ventilation, and natural daylight.
- To achieve thermal comfort levels with minimised need for mechanical heating, ventilation and cooling.
- To reduce indoor air pollutants by encouraging use of materials with low toxic chemicals.
- To reduce reliance on mechanical heating, ventilation, cooling and lighting systems.
- To minimise noise levels and noise transfer within and between buildings and associated external areas.

Initiatives

- All habitable rooms will allow for natural cross ventilation.
- Double glazed windows have been nominated to all living areas and bedrooms to assist with the thermal comfort.
- All carpets, internal paints and all finishes and flooring will be selected for their low VOC properties.
- Engineered wood products will be E1 – E0 grade.
- Where artificial lighting is required, only sealed energy efficient LED light fixtures should be selected or CFL's for common areas like kitchens.
- All kitchen rangehoods to be externally ducted.

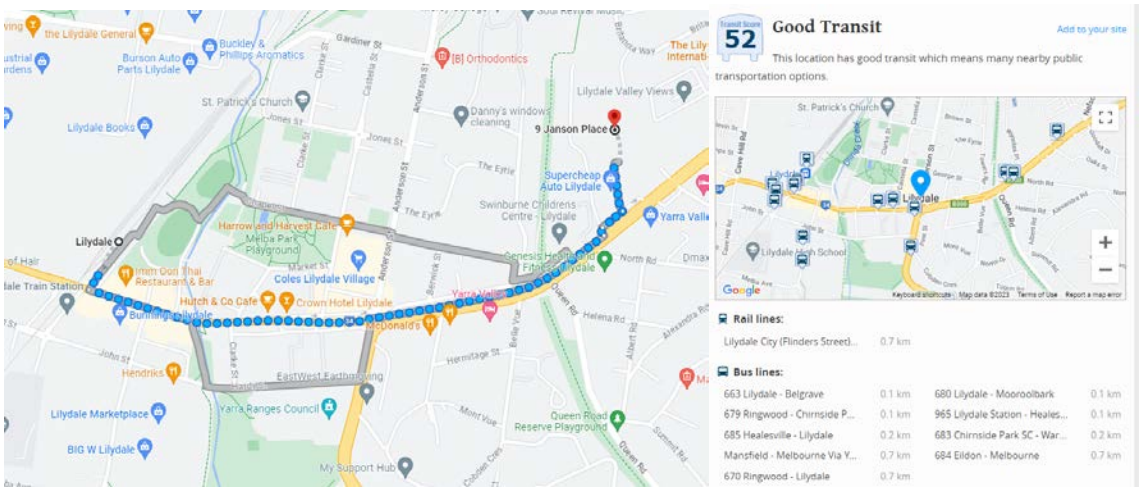
Transport

Objectives

- To ensure that the built environment is designed to promote the use of walking, cycling and public transport, in that order and to minimise car dependency.
- To promote the use of low emissions vehicle technologies and supporting infrastructure.
- The Walk Score is a number between 0 and 100 that measures the walkability of any address to shops, restaurant, parks, entertainment etc.

Initiatives

- There is 1 parking spot for bicycles per unit.
- This location has a Walk Score of 74 out of 100. This location is Very Walkable so most errands can be accomplished on foot.
- This location is in the Lilydale neighborhood in Melbourne. Nearby parks include Lillydale Lake Park, Gateway Reserve and Hull Road Wetlands.
- The site is situated 1.6km to Lilydale train station.
- Three bicycle spaces will be provided for visitors.



Waste management

Objectives

- To promote waste avoidance, reuse and recycling during the design construction and operation stages of the development.
- To ensure durability and long term reusability of building materials.
- To ensure sufficient space is allocated for future change in waste management needs, including (where possible) composting and green waste facilities.

Initiatives

- Recycling and waste receptacles to be installed in the kitchen cabinetry.
- The development is to recycle or reuse a minimum of 80% of construction demolition waste.
- Re-use of excavated material on-site and disposal of any excess to an approved site;
- Green waste mulched and re-used in landscaping either on-site or off-site;
- Bricks, tiles, concrete recycled off-site and plasterboard returned to supplier for recycling;
- Framing timber to be recycled elsewhere;
- Windows, doors, joinery, plumbing, fittings and metal elements recycled off-site;
- All asbestos, hazardous and/or intractable wastes are to be disposed of in accordance with Workcover Authority and EPA requirements;
- Locations of on-site storage facilities for material to be reused on-site, or separated for recycling off-site

Materials

Objectives

- To reduce the environmental impact of materials by recycling of existing material or use of environmentally friendly materials and materials with low embodied energy.

Initiatives

- The development will use sustainable timber, where it meets the Australian Forestry Standard(AFS) or Forest Stewardship Council(FSC) standard and will use E1 or E0-grade engineered wood products.
- The development will use 20-35% supplementary cementitious materials(SCM) as a partial cement alternative, subject to the structural engineer's approval.
- Using recyclable and long lifecycle materials, such as steel, concrete and bricks.
- Materials proposed are local and readily available reducing embodied energy from transportation.
- Industry accepted benchmarks and/or third party certified low VOC and non-toxic products will be used for the development.
- All steel to be sourced from a Responsible Steel Maker i.e. 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)
- All concrete to use recycled aggregate where appropriate and recycled water in its manufacture.

Urban ecology

Objectives

- To protect and enhance biodiversity with the municipality
- To provide environmentally sustainable landscapes and natural habitats, and minimise the urban heat island effect.
- To encourage the retention of significant trees and the planting of indigenous vegetation,
- To encourage the provision of space for productive gardens.

Initiatives

- The vegetation percentage area to be at least 35%.
- The development will include native/indigenous plants.
- Landscape architect to prepare water efficient landscape design.
- Light/medium coloured roofing and/or paving will be used to minimise UHI effect.

NatHERs Ratings

- Energy ratings were modelled in First Rate 5 software version 5.3.2b (3.21).

	Heating	Cooling	Total	Rating
Unit 1	91MJ/m2	17MJ/m2	108MJ/m2	6.5 Stars
Unit 2/3	91.4MJ/m2	15.4MJ/m2	106.8MJ/m2	6.5 Stars
Unit 4	80.6MJ/m2	23.8MJ/m2	104.4MJ/m2	6.6 Stars
Unit 5	84.7MJ/m2	22.5MJ/m2	107.2MJ/m2	6.5 Stars
Unit 6-10	90MJ/m2	17.3MJ/m2	107.3MJ/m2	6.5 Stars
Unit 11	89.3MJ/m2	18.4MJ/m2	107.7MJ/m2	6.5 Stars

Preliminary Energy Rating Assumptions:

Insulation:		Value	
	Floor	**R2.0**	**R2.0** insulation installed between all posi-trusses/floor joists.
	External Walls	**R2.5**	**R2.5** insulation installed between all external stud walls with anti-glare foil (excluding garage).
	Internal Walls	**R2.5**	**R2.5** insulation installed between all party walls, garage, PWDR, LDRY, and bathroom internal stud walls.
	Roof	**R5.0**	**R5.0** insulation installed between all roof trusses (excluding garage).

Glazing – Unit 1/4/6/7/8/9/10/11	Type -
	Aluminium framed double-glazed Awning U-Value: 4.5 SHGC: 0.50 Sliding Window & Door/Fixed U-Value: 4.5 SHGC: 0.61
	Location -
	Unit 1: All proposed windows and glazed doors (excluding PWDR & Bath and Entry). Unit 4: All proposed windows and glazed doors (excluding LDRY, PWDR and Bath) Unit 11: All proposed windows and glazed doors (excluding PWDR & Bath).
Glazing – Unit 2/3	Type -
	Aluminium framed double-glazed Awning U-Value: 4.5 SHGC: 0.57 Sliding Window & Door/Fixed U-Value: 4.5 SHGC: 0.61
	Location -
	Unit 2/3: All proposed windows and glazed doors (excluding ENS).
Glazing – Unit 5	Type -
	Aluminium framed double-glazed

	Awning U-Value: 4.1 SHGC: 0.47 Sliding Window & Door/Fixed U-Value: 4.1 SHGC: 0.5
	Location -
	All proposed windows and glazed doors (excluding LDRY, PWDR, bath and Entry)
Exhaust Fans:	Location – As per working drawings
	Kitchen, ensuite and bathroom. Note: All exhaust fans to be installed with self closing dampers
Weather Protection:	Note -
	Weatherstrip draft protection device to be installed to the bottom of all external doors

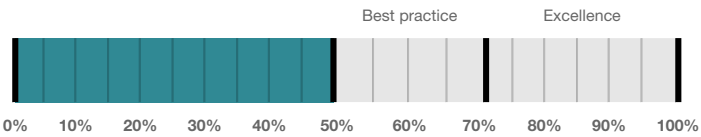
BESS Report

Built Environment Sustainability Scorecard

This BESS report outlines the sustainable design commitments of the proposed development at 9 Janson Pl Lilydale Victoria 3140. The BESS report and accompanying documents and evidence are submitted in response to the requirement for a Sustainable Design Assessment or Sustainability Management Plan at Yarra Ranges Shire Council.

Note that where a Sustainability Management Plan is required, the BESS report must be accompanied by a report that further demonstrates the development's potential to achieve the relevant environmental performance outcomes and documents the means by which the performance outcomes can be achieved.

Your BESS Score

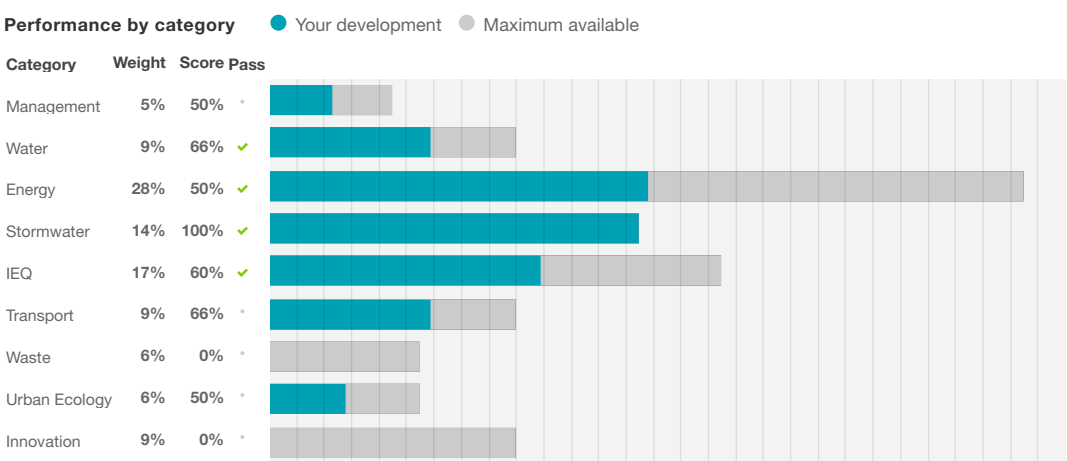


54%

Project details

Address	9 Janson Pl Lilydale Victoria 3140
Project no	131C0086-R5
BESS Version	BESS-7
Site type	Multi dwelling (dual occupancy, townhouse, villa unit etc)
Account	rob@passivenergy.com.au
Application no.	TBC
Site area	3,703.00 m²
Building floor area	1,714.70 m²
Date	01 December 2023
Software version	1.8.0-B.405

Performance by category



Dwellings & Non Res Spaces

Dwellings

Name	Quantity	Area	% of total area
Townhouse			
Unit 6/7/8/9/10	5	142 m^2	41%
Unit 2/3	2	170 m^2	19%
Unit 11	1	185 m^2	10%
Unit 1	1	181 m^2	10%
Unit 5	1	169 m^2	9%
Unit 4	1	129 m^2	7%
Total	**11**	**1,714 m^2**	**100%**

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Water 3.1	Annotation: Water efficient garden details		-
Energy 3.3	Annotation: External lighting controlled by motion sensors		-
Energy 3.4	Location of clothes line (if proposed)		-
Stormwater 1.1	Location of any stormwater management systems (rainwater tanks, raingardens, buffer strips)		-
IEQ 2.2	Annotation: Dwellings designed for 'natural cross flow ventilation' (If not all dwellings, include a list of compliant dwellings)		-
IEQ 3.1	Annotation: Glazing specification (U-value, SHGC)		-
Transport 1.1	Location of residential bicycle parking spaces		-
Transport 1.2	Location of residential visitor bicycle parking spaces		-
Urban Ecology 2.1	Location and size of vegetated areas		-

Supporting evidence

Credit	Requirement	Response	Status
Management 2.2	Preliminary NatHERS assessments		-
Energy 3.5	Average lighting power density and lighting type(s) to be used		-
Stormwater 1.1	STORM report or MUSIC model		-
IEQ 2.2	A list of dwellings with natural cross flow ventilation		-
IEQ 3.1	Reference to floor plans or energy modelling showing the glazing specification (U-value and Solar Heat Gain Coefficient, SHGC)		-

Credit summary

Management Overall contribution 4.5%

	50%
1.1 Pre-Application Meeting	0%
2.2 Thermal Performance Modelling - Multi-Dwelling Residential	100%
4.1 Building Users Guide	100%

Water Overall contribution 9.0%

	Minimum required 50%	66%	✔ Pass
1.1 Potable Water Use Reduction		60%	
3.1 Water Efficient Landscaping		100%	

Energy Overall contribution 27.5%

	Minimum required 50%	50%	✔ Pass
1.2 Thermal Performance Rating - Residential		16%	
2.1 Greenhouse Gas Emissions		100%	
2.2 Peak Demand		0%	
2.3 Electricity Consumption		100%	
2.4 Gas Consumption		100%	
2.5 Wood Consumption		N/A	⌖ Scoped Out
		No wood heating system present	
2.6 Electrification		0%	⊘ Disabled
		Credit is available when project is declared to have no gas connection.	
3.2 Hot Water		100%	
3.3 External Lighting		100%	
3.4 Clothes Drying		100%	
3.5 Internal Lighting - Houses and Townhouses		100%	
4.4 Renewable Energy Systems - Other		0%	⊘ Disabled
		No other (non-solar PV) renewable energy is in use.	
4.5 Solar PV - Houses and Townhouses		0%	⊘ Disabled
		No solar PV renewable energy is in use.	

Stormwater Overall contribution 13.5%

	Minimum required 100%	100%	✔ Pass
1.1 Stormwater Treatment		100%	

IEQ Overall contribution 16.5%

	Minimum required 50%	60%	Pass
2.2 Cross Flow Ventilation		100%	
3.1 Thermal comfort - Double Glazing		100%	
3.2 Thermal Comfort - External Shading		0%	
3.3 Thermal Comfort - Orientation		0%	

Transport Overall contribution 9.0%

	66%
1.1 Bicycle Parking - Residential	100%
1.2 Bicycle Parking - Residential Visitor	100%
2.1 Electric Vehicle Infrastructure	0%

Waste Overall contribution 5.5%

	0%
1.1 - Construction Waste - Building Re-Use	0%
2.1 - Operational Waste - Food & Garden Waste	0%

Urban Ecology Overall contribution 5.5%

	50%
2.1 Vegetation	100%
2.2 Green Roofs	0%
2.3 Green Walls and Facades	0%
2.4 Private Open Space - Balcony / Courtyard Ecology	0%
3.1 Food Production - Residential	0%

Innovation Overall contribution 9.0%

	0%
1.1 Innovation	0%

Credit breakdown

Management Overall contribution 2%

1.1 Pre-Application Meeting		0%
Score Contribution	This credit contributes 50.0% towards the category score.	
Criteria	Has an ESD professional been engaged to provide sustainability advice from schematic design to construction? AND Has the ESD professional been involved in a pre-application meeting with Council?	
Question	Criteria Achieved ?	
Project	No	
2.2 Thermal Performance Modelling - Multi-Dwelling Residential		100%
Score Contribution	This credit contributes 33.3% towards the category score.	
Criteria	Have preliminary NatHERS ratings been undertaken for all thermally unique dwellings?	
Question	Criteria Achieved ?	
Townhouse	Yes	
4.1 Building Users Guide		100%
Score Contribution	This credit contributes 16.7% towards the category score.	
Criteria	Will a building users guide be produced and issued to occupants?	
Question	Criteria Achieved ?	
Project	Yes	

Water

Overall contribution 6% Minimum required 50%

Water Approach	
What approach do you want to use for Water?:	Use the built in calculation tools
Project Water Profile Question	
Do you have a reticulated third pipe or an on-site water recycling system?:	No
Are you installing a swimming pool?:	No
Are you installing a rainwater tank?:	Yes
Water fixtures, fittings and connections	
Showerhead: All	4 Star WELS (>= 6.0 but <= 7.5)
Bath: All	Medium Sized Contemporary Bath
Kitchen Taps: All	>= 5 Star WELS rating
Bathroom Taps: All	>= 5 Star WELS rating
Dishwashers: All	Default or unrated
WC: All	>= 4 Star WELS rating
Urinals: All	Scope out
Washing Machine Water Efficiency: All	Occupant to Install
Which non-potable water source is the dwelling/space connected to?: All	RWT 1-11
Non-potable water source connected to Toilets: All	Yes
Non-potable water source connected to Laundry (washing machine): All	Yes
Non-potable water source connected to Hot Water System: All	No
Rainwater Tank	
What is the total roof area connected to the rainwater tank?: RWT 1-11	1,325 m^2
Tank Size: RWT 1-11	33,000 Litres
Irrigation area connected to tank: RWT 1-11	-
Is connected irrigation area a water efficient garden?: RWT 1-11	-
Other external water demand connected to tank?: RWT 1-11	-

1.1 Potable Water Use Reduction	60%
Score Contribution	This credit contributes 83.3% towards the category score.
Criteria	What is the reduction in total potable water use due to efficient fixtures, appliances, rainwater use and recycled water use? To achieve points in this credit there must be >25% potable water reduction.
Output	Reference
Project	2275 kL
Output	Proposed (excluding rainwater and recycled water use)
Project	1902 kL
Output	Proposed (including rainwater and recycled water use)
Project	1341 kL
Output	% Reduction in Potable Water Consumption
Project	41 %
Output	% of connected demand met by rainwater
Project	100 %
Output	How often does the tank overflow?
Project	Very Often
Output	Opportunity for additional rainwater connection
Project	483 kL

3.1 Water Efficient Landscaping	100%
Score Contribution	This credit contributes 16.7% towards the category score.
Criteria	Will water efficient landscaping be installed?
Question	Criteria Achieved ?
Project	Yes

Energy Overall contribution 14% Minimum required 50%

Dwellings Energy Approach	
What approach do you want to use for Energy?:	Use the built in calculation tools
Project Energy Profile Question	
Are you installing any solar photovoltaic (PV) system(s)?:	No
Are you installing any other renewable energy system(s)?:	No
Energy Supply:	Electricity & Natural Gas
Dwelling Energy Profiles	
Below the floor is: All	Ground or Carpark
Above the ceiling is: All	Outside
Exposed sides:	
Unit 1 Unit 4 Unit 5 Unit 11	3
Unit 2/3 Unit 6/7/8/9/10	2
NatHERS Annual Energy Loads - Heat:	
Unit 1	91.0 MJ/sqm
Unit 2/3	91.4 MJ/sqm
Unit 4	80.6 MJ/sqm
Unit 5	84.7 MJ/sqm
Unit 6/7/8/9/10	90.0 MJ/sqm
Unit 11	89.3 MJ/sqm
NatHERS Annual Energy Loads - Cool:	
Unit 1	17.0 MJ/sqm
Unit 2/3	15.4 MJ/sqm
Unit 4	23.8 MJ/sqm
Unit 5	22.5 MJ/sqm
Unit 6/7/8/9/10	17.3 MJ/sqm
Unit 11	18.4 MJ/sqm
NatHERS star rating:	
Unit 1 Unit 2/3 Unit 5 Unit 6/7/8/9/10 Unit 11	6.5
Unit 4	6.6
Type of Heating System: All	Reverse cycle space
Heating System Efficiency: All	4 Star
Type of Cooling System: All	Refrigerative space
Cooling System Efficiency: All	4 Stars
Type of Hot Water System: All	Gas Instantaneous 5 star
% Contribution from solar hot water system: All	0 %

Clothes Line: All	Private outdoor clothesline
Clothes Dryer: All	Occupant to Install

1.2 Thermal Performance Rating - Residential	16%
Score Contribution	This credit contributes 27.3% towards the category score.
Criteria	What is the average NatHERS rating?
Output	Average NATHERS Rating (Weighted)
Townhouse	6.5 Stars

2.1 Greenhouse Gas Emissions	100%
Score Contribution	This credit contributes 9.1% towards the category score.
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?
Output	Reference Building with Reference Services (BCA only)
Townhouse	84,763 kg CO2
Output	Proposed Building with Proposed Services (Actual Building)
Townhouse	29,301 kg CO2
Output	% Reduction in GHG Emissions
Townhouse	65 %

2.2 Peak Demand	0%
Score Contribution	This credit contributes 4.5% towards the category score.
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?
Output	Peak Thermal Cooling Load - Baseline
Townhouse	143 kW
Output	Peak Thermal Cooling Load - Proposed
Townhouse	142 kW
Output	Peak Thermal Cooling Load - % Reduction
Townhouse	< 1 %

2.3 Electricity Consumption	100%
Score Contribution	This credit contributes 9.1% towards the category score.
Criteria	What is the % reduction in annual electricity consumption against the benchmark?
Output	Reference
Townhouse	72,609 kWh
Output	Proposed
Townhouse	20,203 kWh
Output	Improvement
Townhouse	72 %

2.4 Gas Consumption		100%	
Score Contribution	This credit contributes 9.1% towards the category score.		
Criteria	What is the % reduction in annual gas consumption against the benchmark?		
Output	Reference		
Townhouse	208,197 MJ		
Output	Proposed		
Townhouse	169,154 MJ		
Output	Improvement		
Townhouse	18 %		
2.5 Wood Consumption		N/A	Scoped Out
This credit was scoped out	No wood heating system present		
2.6 Electrification		0%	Disabled
This credit is disabled	Credit is available when project is declared to have no gas connection.		
3.2 Hot Water		100%	
Score Contribution	This credit contributes 4.5% towards the category score.		
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?		
Output	Reference		
Townhouse	208,197 MJ		
Output	Proposed		
Townhouse	171,706 MJ		
Output	Improvement		
Townhouse	17 %		
3.3 External Lighting		100%	
Score Contribution	This credit contributes 4.5% towards the category score.		
Criteria	Is the external lighting controlled by a motion detector?		
Question	Criteria Achieved ?		
Townhouse	Yes		
3.4 Clothes Drying		100%	
Score Contribution	This credit contributes 4.5% towards the category score.		
Criteria	What is the % reduction in annual energy consumption (gas and electricity) from a combination of clothes lines and efficient driers against the benchmark?		
Output	Reference		
Townhouse	7,508 kWh		
Output	Proposed		
Townhouse	1,502 kWh		
Output	Improvement		
Townhouse	80 %		

3.5 Internal Lighting - Houses and Townhouses		100%	
Score Contribution	This credit contributes 4.5% towards the category score.		
Criteria	Does the development achieve a maximum illumination power density of 4W/sqm or less?		
Question	Criteria Achieved?		
Townhouse	Yes		
4.4 Renewable Energy Systems - Other		0%	⊘ Disabled
This credit is disabled	No other (non-solar PV) renewable energy is in use.		
4.5 Solar PV - Houses and Townhouses		0%	⊘ Disabled
This credit is disabled	No solar PV renewable energy is in use.		

Stormwater

Overall contribution 14% Minimum required 100%

Which stormwater modelling are you using?:	Melbourne Water STORM tool	
1.1 Stormwater Treatment	100%	
Score Contribution	This credit contributes 100.0% towards the category score.	
Criteria	Has best practice stormwater management been demonstrated?	
Question	STORM score achieved	
Project	101	
Output	Min STORM Score	
Project	100	

IEQ Overall contribution 10% Minimum required 50%

2.2 Cross Flow Ventilation		100%
Score Contribution	This credit contributes 20.0% towards the category score.	
Criteria	Are all habitable rooms designed to achieve natural cross flow ventilation?	
Question	Criteria Achieved ?	
Townhouse	Yes	
3.1 Thermal comfort - Double Glazing		100%
Score Contribution	This credit contributes 40.0% towards the category score.	
Criteria	Is double glazing (or better) used to all habitable areas?	
Question	Criteria Achieved ?	
Townhouse	Yes	
3.2 Thermal Comfort - External Shading		0%
Score Contribution	This credit contributes 20.0% towards the category score.	
Criteria	Is appropriate external shading provided to east, west and north facing glazing?	
Question	Criteria Achieved ?	
Townhouse	No	
3.3 Thermal Comfort - Orientation		0%
Score Contribution	This credit contributes 20.0% towards the category score.	
Criteria	Are at least 50% of living areas orientated to the north?	
Question	Criteria Achieved ?	
Townhouse	No	

Transport Overall contribution 6%

1.1 Bicycle Parking - Residential	100%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	How many secure and undercover bicycle spaces are there per dwelling for residents?
Question	Bicycle Spaces Provided ?
Townhouse	11
Output	Min Bicycle Spaces Required
Townhouse	11

1.2 Bicycle Parking - Residential Visitor	100%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	How many secure bicycle spaces are there per 5 dwellings for visitors?
Question	Visitor Bicycle Spaces Provided ?
Townhouse	3
Output	Min Visitor Bicycle Spaces Required
Townhouse	3

2.1 Electric Vehicle Infrastructure	0%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	Are facilities provided for the charging of electric vehicles?
Question	Criteria Achieved ?
Project	No

Waste Overall contribution 0%

1.1 - Construction Waste - Building Re-Use	0%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	If the development is on a site that has been previously developed, has at least 30% of the existing building been re-used?
Question	Criteria Achieved ?
Project	No

2.1 - Operational Waste - Food & Garden Waste	0%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	Are facilities provided for on-site management of food and garden waste?
Question	Criteria Achieved ?
Project	No

Urban Ecology Overall contribution 3%

2.1 Vegetation	100%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	How much of the site is covered with vegetation, expressed as a percentage of the total site area?
Question	Percentage Achieved ?
Project	35 %

2.2 Green Roofs	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Does the development incorporate a green roof?
Question	Criteria Achieved ?
Project	No

2.3 Green Walls and Facades	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Does the development incorporate a green wall or green façade?
Question	Criteria Achieved ?
Project	No

2.4 Private Open Space - Balcony / Courtyard Ecology	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Is there a tap and floor waste on every balcony / in every courtyard?
Question	Criteria Achieved ?
Townhouse	No

3.1 Food Production - Residential	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	What area of space per resident is dedicated to food production?
Question	Food Production Area
Townhouse	-
Output	Min Food Production Area
Townhouse	9 m^2

Innovation Overall contribution 0%

1.1 Innovation	0%
Score Contribution	This credit contributes 100.0% towards the category score.
Criteria	What percentage of the Innovation points have been claimed (10 points maximum)?

Disclaimer

The Built Environment Sustainability Scorecard (BESS) has been provided for the purpose of information and communication. While we make every effort to ensure that material is accurate and up to date (except where denoted as 'archival'), this material does in no way constitute the provision of professional or specific advice. You should seek appropriate, independent, professional advice before acting on any of the areas covered by BESS.

Nationwide House Energy Rating Scheme
NatHERS Certificate

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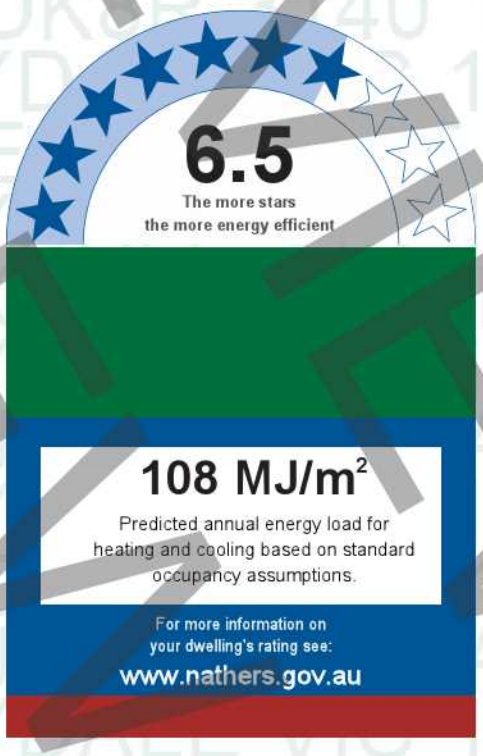

Property

Address	1, 9 Janson Place, Lilydale, VIC, 3140
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	22/2777B / 12/05/23
Prepared by	DeNavi Building Design

Construction and environment

Assessed floor area (m²)*	
Conditioned*	145.3
Unconditioned*	44.2
Total	189.5
Garage	35.7

Exposure type
suburban

NatHERS climate zone
62 Moorabbin Airport

Thermal performance

Heating	Cooling
91 MJ/m²	**17** MJ/m²

About the rating
NatHERS software models the expected thermal energy loads using information about the design and construction, climate and common patterns of household use. The software does not take into account appliances, apart from the airflow impacts from ceiling fans.

Accredited assessor

Name	Rob Iacono
Business name	PassivEnergy
Email	rob@passivenergy.com.au
Phone	0401 248 348
Accreditation No.	DMN/11/1259

Assessor Accrediting Organisation
Design Matters National

Declaration of interest	Declaration completed: no conflicts

Verification

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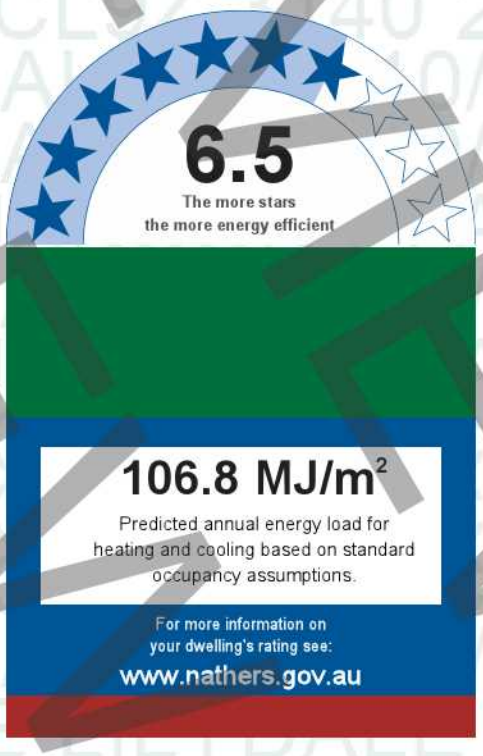

Property

Address	2, 9 Janson Place, Lilydale, VIC, 3140
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	22/2777B / 12/05/23
Prepared by	DeNavi Building Design

Construction and environment

Assessed floor area (m²)*	
Conditioned*	144.9
Unconditioned*	37.2
Total	182.1
Garage	35.7

Exposure type
suburban

NatHERS climate zone
62 Moorabbin Airport

Thermal performance

Heating	Cooling
91.4 MJ/m²	15.4 MJ/m²

About the rating
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NatHERS Certificate

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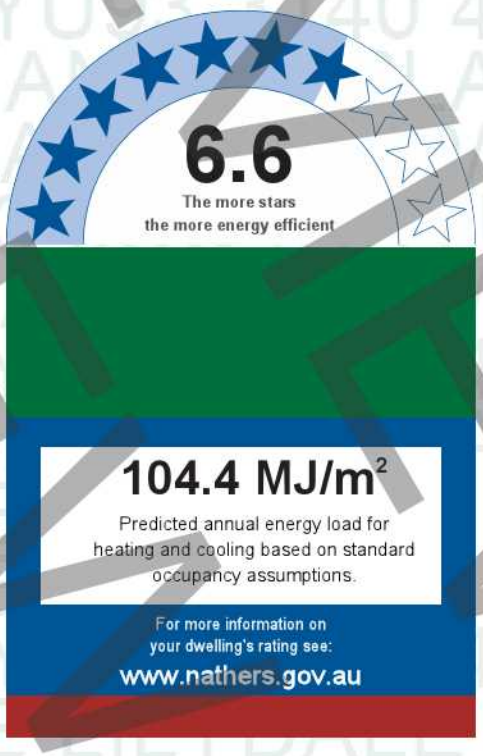

Property

Address	4, 9 Janson Place, Lilydale, VIC, 3140
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	22/2777B / 12/05/23
Prepared by	DeNavi Building Design

Construction and environment

Assessed floor area (m²)*	
Conditioned*	129.3
Unconditioned*	49.3
Total	178.6
Garage	35.6

Exposure type
suburban

NatHERS climate zone
62 Moorabbin Airport

Thermal performance

Heating	Cooling
80.6 MJ/m²	23.8 MJ/m²

About the rating
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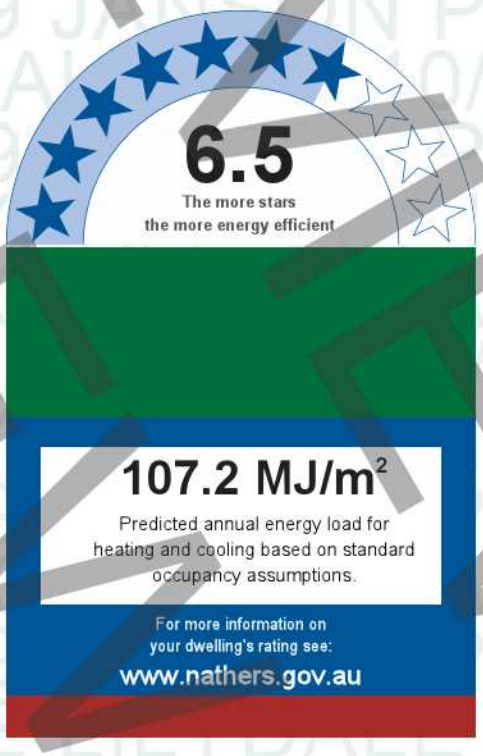

Property

Address	5, 9 Janson Place, Lilydale, VIC, 3140
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	22/2777B / 12/05/23
Prepared by	DeNavi Building Design

Construction and environment

Assessed floor area (m²)*	
Conditioned*	132
Unconditioned*	49
Total	181
Garage	35.8

Exposure type
suburban

NatHERS climate zone
62 Moorabbin Airport

Thermal performance

Heating	Cooling
84.7 MJ/m²	22.5 MJ/m²

About the rating
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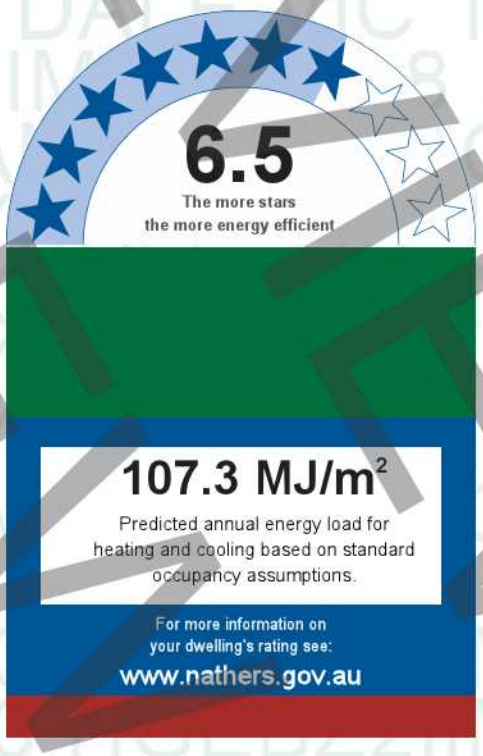

Property

Address	8, 9 Janson Place, Lilydale, VIC, 3140
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	22/2777B / 12/05/23
Prepared by	DeNavi Building Design

Construction and environment

Assessed floor area (m²)*	
Conditioned*	125.5
Unconditioned*	39.6
Total	165.1
Garage	38

Exposure type
suburban

NatHERS climate zone
62 Moorabbin Airport

Thermal performance

Heating	Cooling
90 MJ/m²	17.3 MJ/m²

About the rating
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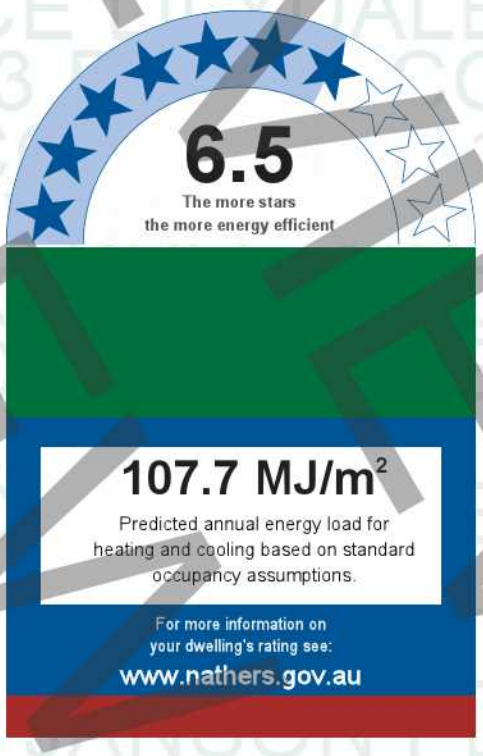

Property

Address	11, 9 Janson Place, Lilydale, VIC, 3140
Lot/DP	-
NCC Class*	Class 1a
Type	New Home

Plans

Main plan	22/2777B / 12/05/23
Prepared by	DeNavi Building Design

Construction and environment

Assessed floor area (m²)*	
Conditioned*	150.2
Unconditioned*	44.3
Total	194.5
Garage	35.7

Exposure type
suburban

NatHERS climate zone
62 Moorabbin Airport

Thermal performance

Heating	Cooling
89.3 MJ/m²	18.4 MJ/m²

About the rating
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STORM Rating Report

TransactionID: 0
Municipality: YARRA RANGES
Rainfall Station: YARRA RANGES
Address: 9 Janson Place

Lillydale
VIC 3140
Assessor:
Development Type: Residential - Multiunit
Allotment Site (m2): 3,703.45
STORM Rating %: 101

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
Unit 1-11 RWT roof area	1,100.00	Rainwater Tank	30,000.00	40	154.00	87.60
Unit 1-11 RWT roof area	224.90	Rainwater Tank	3,000.00	6	94.20	85.00
Common Driveway	578.20	None	0.00	0	0.00	0.00
Common Driveway RG	50.00	Raingarden 100mm	1.00	0	128.10	0.00

Date Generated: 27-Nov-2023 Program Version: 1.0.0

INSTRUCTION SHEET

Building an inground raingarden

healthy waterways
Raingardens

What is an inground raingarden?

Building a raingarden is a simple way to help the environment and the health of our local waterways while providing a self-watering garden for your backyard.

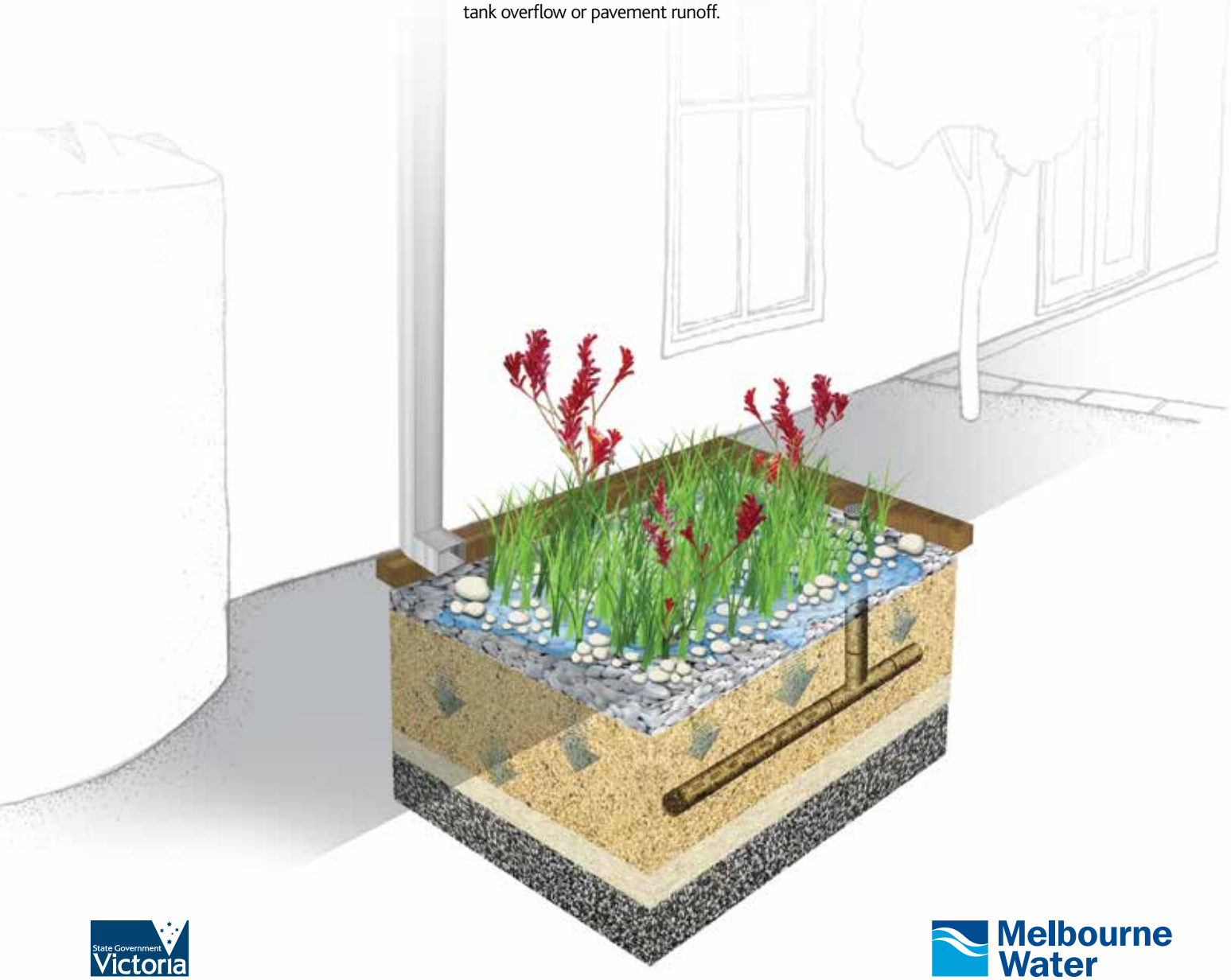
A raingarden is a specially prepared garden designed to receive and filter rain run-off from roofs or hard surfaces such as driveways or paving.

Featuring layers of soil for filtration, gravel for drainage, and plants that can tolerate periods without rain, a raingarden helps to protect our streams and rivers from stormwater pollutants.

With a slotted pipe beneath the soil to take away the filtered rainwater and an overflow pipe on the surface to prevent flooding, raingardens are designed to collect water from a disconnected downpipe, rainwater tank overflow or pavement runoff.

Please note: A certified plumber must be used for stormwater connections and modifications.

Did you know that a raingarden is only wet during and immediately after rain, leaving it dry most of the time? This is due to the drainage and filtration properties of the soil combination used in the raingarden.



State Government Victoria

Melbourne Water

Building your raingarden

Step 1 – getting started

Location

Build your raingarden as close as possible to the water source – whether it is a downpipe, rainwater tank overflow, paved area or driveway. This will help minimise the additional plumbing needed to bring water to the raingarden.

Table 1 sets out how far away your raingarden needs to be from your house depending on how deep your existing foundations are. A minimum distance of 300mm from your house is recommended.

Ensure when digging near your foundations not to disturb areas directly underneath the foundations and area as shown below – 'no dig zone'.

Handy Hint - Avoid building your raingarden underneath large trees as the root system will interfere with your excavations. As a general rule, the root zone will extend out to the edge of the tree canopy.

Having decided on a location, it is important to determine the depth of the existing underground stormwater pipe to make sure your raingarden is connected properly. Your local plumber can help with this and also how and when to disconnect your downpipe so that the area doesn't flood during construction.

Stormwater reconnection

All connections or modifications to existing stormwater pipes need to be done by a licensed plumber. The plumber should ensure that pipes are reconnected into the property's stormwater and not another services such as the sewer.

Underground services

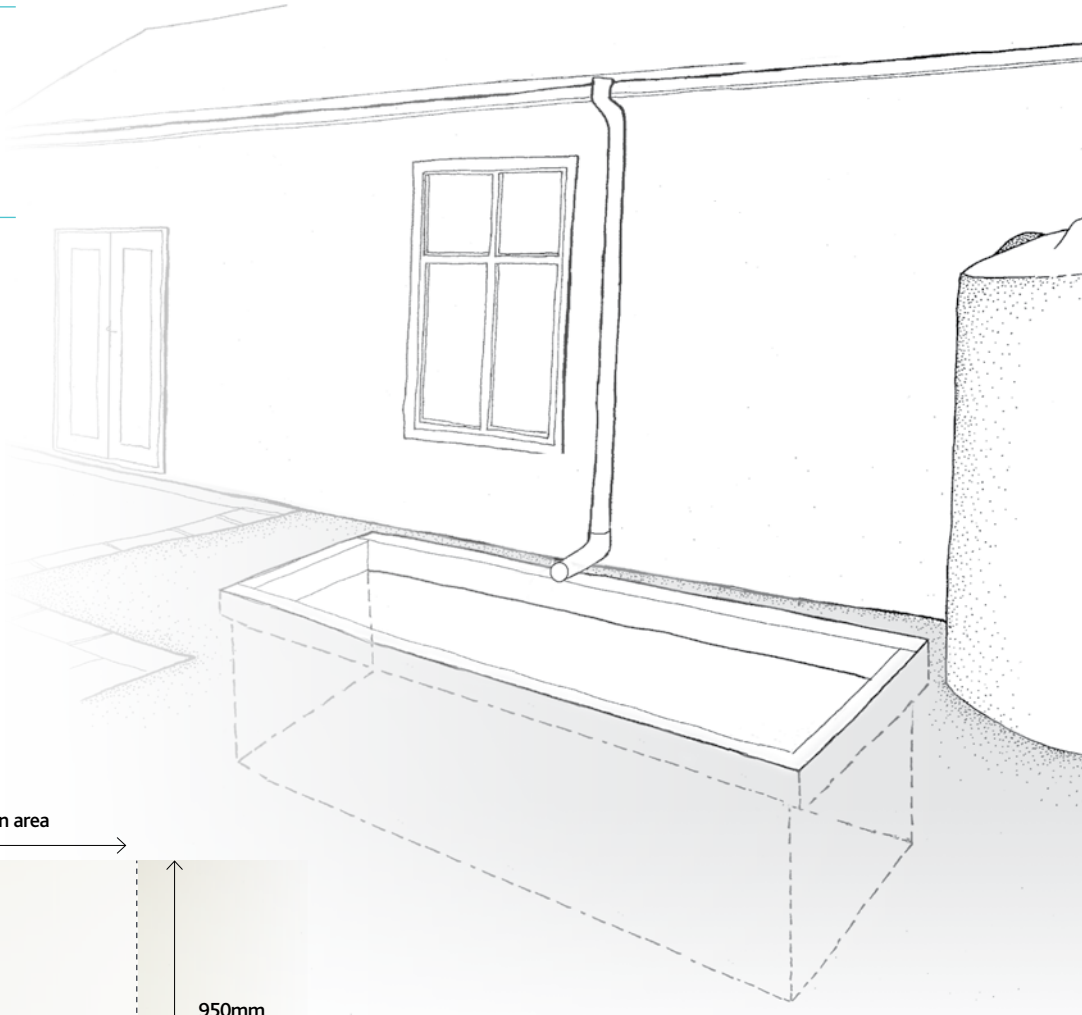
Be aware of any underground services (gas, electricity, water) that run near your house or under your garden as this will influence where you can excavate your raingarden. Raingardens should not be built over or in close proximity to a septic system.

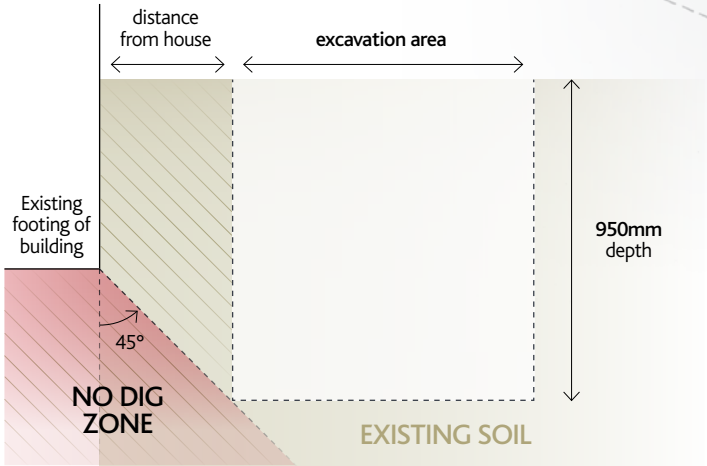
Materials

See *Materials List* for information about what you need to build a raingarden.

Table 1 – Footing depth chart

EXISTING HOUSE FOUNDATION DEPTH	RAINGARDEN MINIMUM DISTANCE FROM FOOTING
150 mm	800 mm
250 mm	700 mm
350 mm	600 mm
450 mm	500 mm
550 mm	400 mm
650 mm	300 mm





Size

You need to make sure that your raingarden is large enough to manage the amount of stormwater it will receive. If your raingarden is going to capture run-off from the roof via a downpipe, measure the area of roof that drains to that downpipe. Generally, the size of the raingarden should be approximately 2% of the run-off area. Table 2 will help you work out the correct size.

Table 2 – Raingarden sizing chart

AREA OF RUN-OFF (m²)	RAINGARDEN SIZE (m²)
50	1
100	2
150	3
200	4
250	5
300	6
350	7
400	8
450	9

Step 2 - excavation and pipe infrastructure

Excavation

Excavate your raingarden with a gentle slope towards the stormwater outlet (where the water will exit your raingarden).

Line your raingarden (base and sides) with a PVC liner. Overlap the sheets by 200mm and seal the joins with PVC tape.

Place the 7mm screenings (gravel) to a depth of 50mm. This will form a base for the slotted drainage pipe. Make sure the screenings are washed and clean of excess dirt as this can create blockages in the raingardens drainage.

Pipe Infrastructure

Lay a 90mm diameter slotted drainage pipe horizontally along the centre of the raingarden base and cap one end of the slotted drainage pipe. Call your plumber to connect the drainage pipe back into the property's existing stormwater.

Handy Hint – If your raingarden is greater than 4m wide, you will need to install two slotted drainage pipes and two overflow pipes. These need to be evenly spaced across the raingarden base to provide adequate drainage.

Connect the vertical 90mm diameter overflow pipe into the slotted drainage pipe using a 90 degree elbow pipe and seal. When the raingarden is finished, the top of the overflow pipe should sit 100mm above the gravel mulch and 100mm below the surrounding ground level.

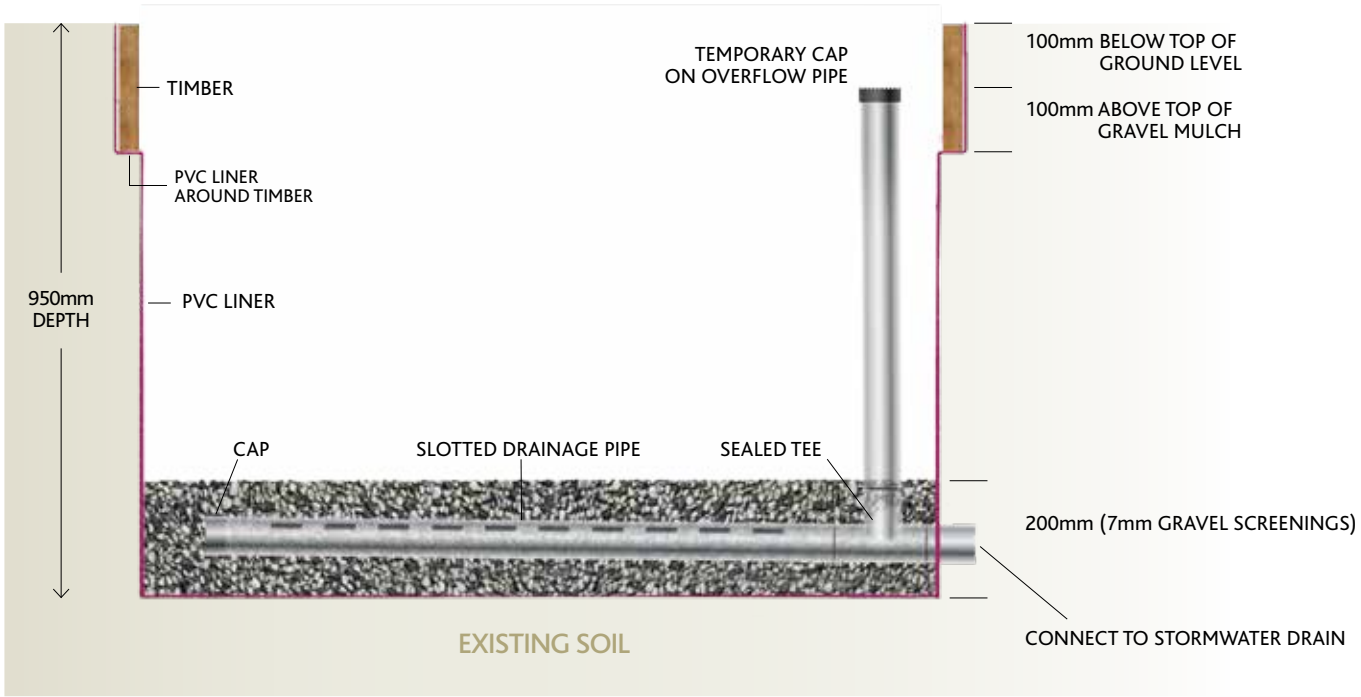
Install a temporary cap on top of the overflow pipe to prevent materials dropping into it during construction. Some plastic taped across the top of the pipe will work fine.

Frame

Install a frame to separate your raingarden from the surrounding soil. If using timber, ensure that it is no less that 50mm thick. While Class 1 or similar hardwood (200mm x 50mm) is ideal for this type of frame, you can use any material available that is a similar thickness and won't warp or bend over time.

Excavate a ledge around the top of the raingarden for the frame to rest on. The top edge of the frame needs to sit level with the surrounding ground.

Ensure that the PVC liner sits between the frame and surrounding ground. Secure the PVC liner to the frame to prevent surrounding soil entering the raingarden.



Building your raingarden

Step 3 – soil layers

Screenings layer

Add 7mm screenings (gravel) to a depth of 150mm over the slotted drainage pipe in the base of your raingarden. This brings to total depth of screenings (gravel) to 200mm. Be careful when not to dislodge or damage the slotted drainage pipe when adding the additional screenings.

Sand layer

Place white washed sand to a depth of 100mm over the screenings (gravel) layer.

Sand/soil mix layer

Mix 4 parts white washed sand with 1 part topsoil. Add this mix to the raingarden to a depth of 400mm.

Handy Hint – Ensure you firmly put down each layer of soil when building your raingarden to help reduce the layers from sinking.

Step 4 – pipe adjustments, plants and mulch

Pipe adjustments

Redirect your downpipe into the raingarden using pipe bends where required. If possible, use two 45 degree bends connected together as this will provide a much gentler and more even flow of water, reducing the risk of erosion and prevent blockages within the downpipe. A 90 degree elbow pipe will do as an alternative.

Handy Hint – To help prevent your raingarden from overflowing, it is important that the raingarden frame sits higher than the top of the overflow pipe.

Plants

In general, plants that grow well in a raingarden:

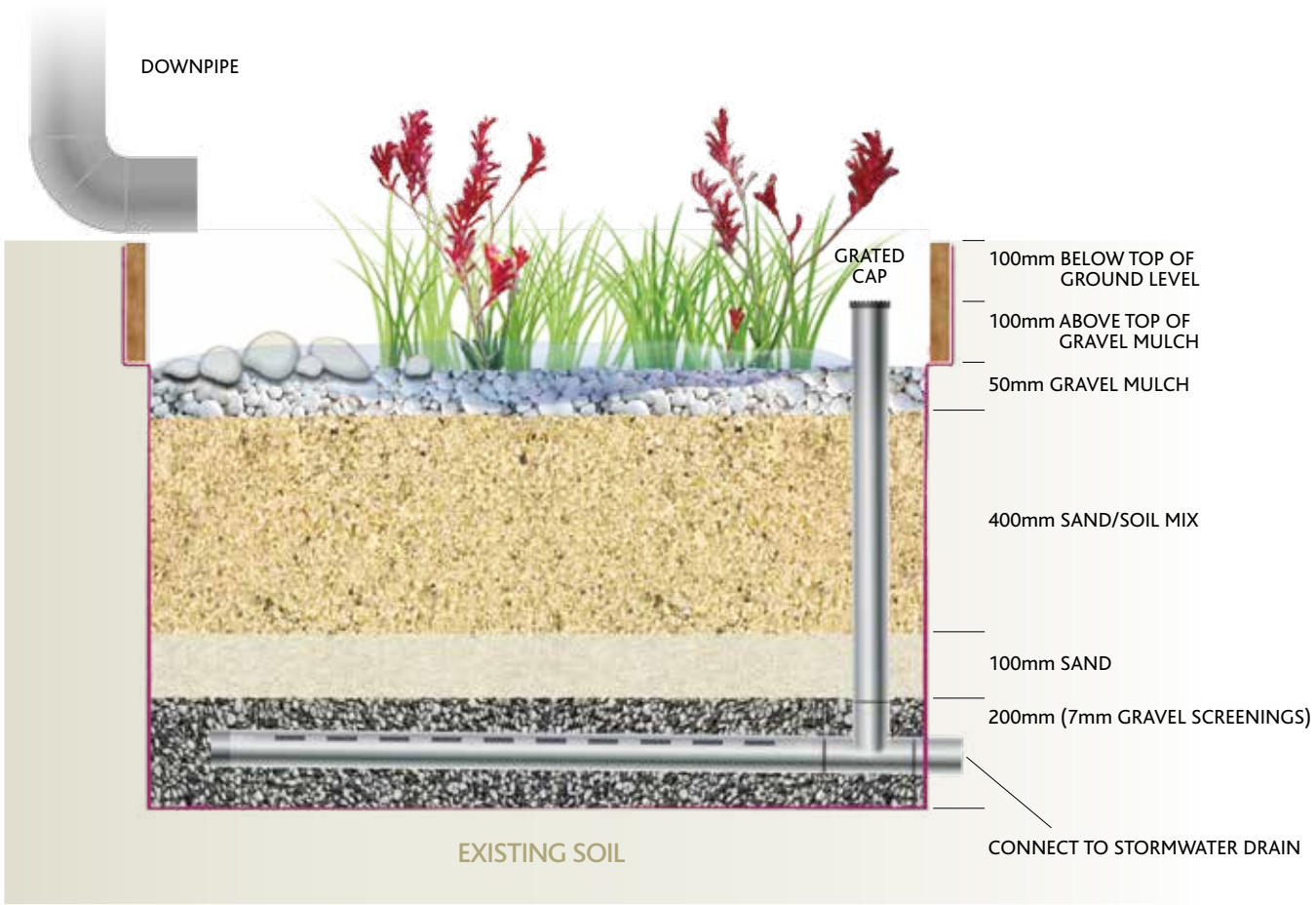
- like dry conditions but can tolerate temporary wet periods
- are perennial rather than annual
- have an extensive fibrous root system.

A wide range of plants are suitable for raingardens and your local nursery will be able to guide you on what is right for your area. There are also particular plants that are really good at removing pollutants from stormwater. These include:

- *Carex appressa*
- *Lomandra longifolia*
- *Juncus flavidus*
- *Melaleuca ericifolia*
- *Goodenia ovate.*

50% of your raingarden should be planted with these species, the other 50% can be made up of plants that like a dry environment with intermittent wet periods. It is important that the plants you select are suitable for the amount of sun and shade on your raingarden. See the *Plant List* for a suggested list of suitable raingarden plants.

Regardless of the type of plants you select, it is important to plant densely to cover the raingarden, set your plants out at roughly 6 plants per m². So for a 2m² raingarden, you will need to buy 12 plants. Now start planting.



Looking after your raingarden

Mulch
Spread gravel mulch to a depth of 50mm around the plants.

To allow the spread of water gently over the raingarden, place some large flat rocks where water flows from the downpipe. Place smaller rocks in between the large rocks to fill the gaps and help prevent erosion. Alternatively a flow spreading device can be fitted to the downpipe.

Remove the temporary end cap from overflow pipe and replace with a 90mm PVC finishing collar and domed pipe grate.

Water the plants in – complying with your local water restrictions.

Need help?
If you have questions about building a raingarden, your landscape gardener or local plumber may be able to help. For more information visit melbournewater.com.au/raingardens

Once established, raingardens are low maintenance especially when planted with native plant species. They don't need to be watered, mowed or fertilised. However, a few simple tips can help your raingarden mature and function well.

- Gravel mulch will help retain moisture in your raingarden and prevent weeds from growing.
- Ensure that the overflow is never blocked.
- Remove any sediment or build up from the downpipe.
- Some weeding may need to take place until plants have matured.
- Evenly distribute water flow into your garden to limit erosion from heavy rainfall. Strategically placed rocks may help with this.
- Inspect your garden regularly – replace plants and repair erosion when necessary.
- Driving over or squashing your raingarden will affect its ability to work efficiently.
- Avoid using organic (timber) mulch as this will float in the raingarden and may casue blockages.

Note – If necessary, water your raingarden until your plants have established in compliance with your local water restrictions.

Materials List – what you need to build your raingarden

Table 3 details the materials required to create a 2m² raingarden. While item prices may vary depending on the materials you select, building a 2m² raingarden is likely to cost between $400 and $500 (plus the cost of a plumber).

Table 3 – Raingarden materials list

QUANTITY	MATERIAL
6 l/m	200mmx50mm Class 1 hardwood sleepers
2 l/m	90mm diametre slotted drainage pipe (Ag Pipe)
2 l/m	90mm diametre uPVC pipe*
0.4m³	7mm screenings
0.85m³	Sand (white washed)
0.15m³	Topsoil
12	Plants (150mm pots)
0.1m³	Gravel mulch
1	90mm diametre uPVC 90 degree bend or 2x 45 degree bends
1	PVC grate 90mm finishing collar
1	PVC 90mm diametre domed pipe grate
1	PVC 90mm tee
1	PVC 90mm cap
10m²	PVC liner
	PVC tape

**Costs per square meter will depend on the length of connections back to the existing stormwater drain.*

l/m = lineal metres m² = square metres m³ = cubic metres mm = millimetres

Plant List – the best plants for your raingarden

The following plants grow well in raingardens.

Table 4 – Raingarden plant list

BOTANICAL NAME	COMMON NAME	CONDITIONS	SIZE (H x W) (cm)
Anigozanthos sp.	Kangaroo paw	Full sun	30-90 x 100-120
Blechnum nudum	Fishbone Water-fern	Full sun to partial shade	50-100 x 40-80
Calocephalus lacteus	Milky Beauty-heads	Full sun to partial shade	15-30 x 10-30
Carex Appressa	Tall Sedge	Full sun to partial shade	80-100 x 120
Carpobrotus modestus	Pigface	Full sun	20cm high and spreading
Chrysocephalum apiculatum	Common Everlasting	Full sun	30-90 x 10-30
Derwentia perfoliata	Digger's Speedwell	Full sun to partial shade	20-40 x 30-60
Dianella species		Full sun to partial shade	60-120 x 40-150
Ficinia nodosa	Knobby Club-rush	Full sun	50-150 x 60-200
Juncas amabilis	Hollow Rush	Full sun to partial shade	20-120 x 20-50
Juncas flavidus	Yellow Rush	Full sun to partial shade	40-120 x 20-100
Leucaphyta brownii	Cushion Bush	Full sun, salt tolerant	100 x 200
Lomandra species		Full sun to partial shade	60-120 x 50-100
Melaleuca ericifolia	Swamp paperback	Full sun to partial shade	4m high x 3m wide
Myoporum parvifolium	Creeping Boobialla	Full sun	20-30 x 300
Patersonia occidentalis	Native iris	Sun to partial shade	20-40 x 30-60
Pratia perdunculata	Matter Pratia	Partial shade	50-150 x 1.8-5
Wahlenbergia communis	Tufted Bluebell	Full sun	15-50 x 15

Melbourne Water
990 La Trobe Street
Docklands VIC 3008

PO Box 4342
Melbourne Victoria 3001

Telephone 131 722
melbournewater.com.au/raingardens

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Melbourne Water

2.4 INSPECTION AND MAINTENANCE SCHEDULE

This is an example schedule to guide the timing of your inspection and maintenance activities. This schedule outlines the average service the assets require, but you can adjust these timings to suit your assets. This schedule and the "Inspection and Maintenance form" (see over page) have been designed to be copied and used on site.

Responsibility of assets
Example: Regular inspections should be carried out every 3 months. The inspection and maintenance of the raingarden including all civil and landscape components is the responsibility of Council/contractor. The operation and maintenance of adjacent stormwater infrastructure, parklands, garden beds, recreational assets, pathways and road surfaces is the responsibility of Council.

Item	What to check for	Action	Frequency
Civil components – Raingarden			
Inlet	No evidence of erosion, blockage, damage or standing water.	Clear inlet of accumulated sediment or debris. Eroded areas should be locally re-profiled or reinforced, and re-planted if necessary. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if the erosion is either recurring or severe.	Storm events 3 months
Outlet	No evidence of erosion, blockage, damage or standing water Outlet freely draining.	Clear outlet of accumulated sediment or debris. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if standing (backwatering into the raingarden) is present.	Storm events 3 months
Other structures	No evidence of erosion and damage to other structures, e.g. pits, pipes, access ramps, walls and rock protection.	Repair minor damage to structures. Eroded areas should be repaired (reinforced). This may involve minor re-profiling or re-planting works. For severe damage, i.e. where flows have scoured down the side of a structure refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*.	3 months
Batters and bunds	No evidence of erosion.	Eroded areas should be locally re-profiled or reinforced, and re-planted if necessary.	Annually
Hydraulic conductivity	Filter media is draining freely. No water ponded on the surface of the raingarden for more than 12 hours after rainfall.	If water is ponded on the surface of the raingarden for more than 12 hours after rainfall, refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*. Note: the disposal of raingarden filter material must comply with EPA Victoria guidelines for the disposal of contaminated soil (Appendix C).	Storm events
Sediment accumulation	Sediment forebay less than 75% full. No major sediment accumulation on surface of the raingarden.	Clean out accumulated sediment from the sediment forebay. Accumulated sediment to be removed from the surface of the raingarden and the system replanted as required.	Annually
Filter media surface	No surface scour, depressions.	Filter surface to be repaired. This may involve evening out the surface, importing additional filter media and replanting.	3 months
Fine sediment surface crust	No impermeable or clayey surface on the filter media. No major surface crusting (<3mm depth across less than 10% of the filter area is permissible).	Repair surface layer by scarify filter media surface, re-profiling and re-establishing vegetation, if required. If the problem persists refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*.	3 months
Mulch layer	Even depth and distribution of the mulch layer. Surface of the mulch layer is at least 100 mm below the top of the outflow pit. Mulch is not touching the plant stems	Re-distribute or replace mulch that has been washed out or displaced. This may involve retaining mulch using jute mats or nets. Remove mulch that is touching plant stems.	3 months
Algal or moss growth	No major algal growth (less than 10% of raingarden area is permissible). No moss growth.	If significant patches of algal growth or moss persist across the surface of the raingarden (i.e. greater than 10% of the surface) then refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*.	3 months
Inspection opening	Water level is below filter media layer. No sediment accumulation in underdrain system.	Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if standing water is present in the filter media layer. Flush the underdrain system using low pressure water jet to remove accumulated sediment.	Annually

Item	What to check for	Action	Frequency
Landscape components – Raingarden			
Vegetation cover – filter media	Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.	Remove any dead or diseased vegetation. Replant individual bare patches (greater than 5% of the area) using either new plants or by dividing and translocating existing plants. If bare areas represent greater than 30% of the raingarden area, refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*.	3 months
Vegetation cover – batters	Continuous vegetation cover along the lower batter. Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.		Annually
Weeds – filter media – batters	Less than 10% of the filter media surface area and batters covered in weeds.	Physically remove weeds from filter media surface and batters. Do not use herbicides as these may harm the desirable raingarden vegetation and contaminate the filter media. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if weed ingress is a persistent problem (i.e. weed coverage is persistently greater than 30%).	3 months
Litter	Filter media surface and batters free of litter (i.e. less than 1 piece litter per 4m^2).	Remove all litter and excessive debris	3 months
Pests	No damage by pest animals and insects.	Seek specialist advice if persistent insect damage is observed. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if there is evidence of pest animal damage.	3 months

Rainwater Tanks

Stormwater Sensitive Homes

How does a rainwater tank help protect our local streams?

Most people install a rainwater tank primarily to harvest stormwater from their roof and conserve their mains water use. In addition to conserving water, a rainwater tank also helps treat stormwater and protect local streams from high storm flows by reducing the volume of stormwater and quantity of pollutants coming from a house block that would otherwise be delivered to the local stream.

What do I use my tank water for?

Garden irrigation, laundry and toilet flushing consume much of our home water use. In most cases these uses do not require the water to be of drinking quality standard that is provided by mains water. By plumbing your rainwater tank to your toilet or laundry and substituting these mains water needs with the rainwater harvested from your roof, you can conserve mains water whilst reducing the amount of stormwater that enters our streams.

A typical home uses approximately 250,000 litres of water each year.

MelbourneWater

Melbourne Water 131772
Melbourne Water Corporation, PO Box 4342, Melbourne Victoria 3001

Rainwater Tanks

Stormwater Sensitive Homes

Why can't I use my rainwater tank for my garden alone?

So that your tank is not too full to collect rainwater when it rains, you need to be consistently using your tank water all year round.

If tank water is used for your garden alone, your tank will remain full and unused during the winter months when your garden does not require watering. With a full tank, your capacity to capture and store the regular winter rainfall and thus benefit the local waterway is significantly reduced.

By plumbing your rainwater tank to your toilet or laundry, your tank water is used consistently all year round allowing rainfall to refill the tank more often especially in winter. This ultimately reduces the volume of stormwater that is delivered to the stream and the quantity of pollutants that are washed with it.

The Victorian Government has recognised the importance of plumbing your tank to your toilet and offers a cash rebate for the installation of connected rainwater tanks (www.dse.vic.gov.au). In addition, a 5 star energy standard has been introduced that requires a connected 2000Lt rainwater tank or solar hot water service to be installed in all new houses and apartments (class 1 and 2 buildings). (www.buildingcommission.com.au).

How do I choose a rainwater tank?

The most important thing to consider when choosing a rainwater tank is to first identify what you want from your rainwater tank. The size and type of rainwater tank you choose will vary depending on your homes water needs and the reliability you seek from your rainwater tank supply. There are a number of factors that may influence this and the following questions should be considered when planning your tank installation:

- what is the water demand of your home?
- how many people are living in your home?
- what is your intended use of rainwater?
- what reliability do you want from your tank?
- what is the total area of roof draining into your tank?
- what is average rainfall of your area?
- do you need extras like a pressure pump, the ability to top up your tank with drinking water, a backflow prevention device or a first flush device?
- are the materials used on your roof suitable to collect rainwater?
- are there physical constraints of your property that may influence the type of rainwater tank you need?

Once you know how much water you can collect and how much water you are going to use then a tank size can be selected to provide the reliability of water supply that you need.

Types of rainwater tanks

Rainwater tanks come in a variety of materials, shapes and sizes and can be incorporated into building design so they don't impact on the aesthetics of the development. They can be located above ground, underground, under the house or can even be incorporated into fences or walls.

There are three main tank systems to consider and a variety of materials to choose from. Features of these are outlined below and in the pictures above:

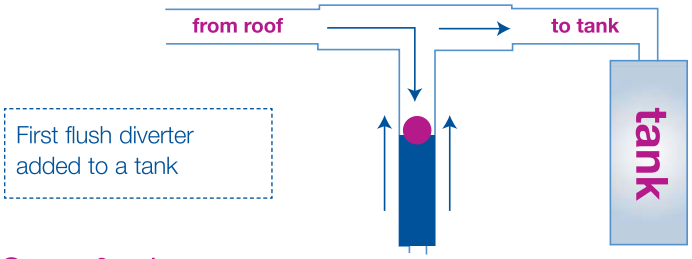
Tank systems:

Gravity Systems - rely on gravity to supply rainwater to the household and the garden by placing the tank on a stand at height.

Dual Supply Systems - top your rainwater tank with mains water when tank level is low ensuring reliable water supply.

Pressure Systems - use a pump to deliver rainwater to household and garden fixtures.

To reduce the amount of sediment and debris entering a tank, mesh screens and 'first flush diverters' can be fitted. A screen will filter large debris such as leaves and sticks while 'first flush diverters' store the 'first flush' of the rainfall that carries the sediment and other pollutants initially washed from your roof (see figure below).



Costs & rebates

Costs of installing a tank vary however a standard 2000Lt tank or bladder will cost around $1000.

Additional plumbing and/ or.....

- Above ground tanks cost approximately $250 for a 500 litre tank.
- Below ground tanks cost between $300-$600 per 1000 litres of storage
- The costs of pumps start from $200.

Additional plumbing and/or excavation costs vary on intended use, pipe layout, materials and site accessibility.

The Victorian Government offers a total rebate of $300 for the installation of a rainwater tank that is plumbed to toilet and connected by a licensed plumber. For further details refer to the Department of Sustainability and Environment website www.dse.vic.gov.au.

For more information:

Melbourne Water's Water Sensitive Urban Design Website: www.wsud.melbournewater.com.au

Municipal Association of Victoria Clearwater Program: www.clearwater.asn.au

Water Sensitive Urban Design in the Sydney Region: www.wsud.org

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