



Sustainable Design Assessment

Date: 9 November 2023

Assessment of: Proposed Residential Development | 54 Ashley St, West Footscray VIC 3012


Commissioned by: Explode Pty Ltd

**CITY OF MARIBYRNONG
ADVERTISED PLAN**



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ESD Initiatives

ESD Initiatives	
Proposed Residential Development	54 Ashley St, West Footscray VIC 3012
Category	Implementations
Rainwater harvesting and stormwater management system	<ul style="list-style-type: none"> - 9 x 2,000L Rainwater harvesting tanks per dwelling (total of 18,000L of rainwater storage capacity in the development). - All Rainwater tanks connected to toilet flushing throughout the building.
Water efficient fixtures / fittings	To ensure the efficient use of water and thereby reduce total operating potable water use, fixtures & fittings will have the following WELS ratings.
	- 4 Star WELS showerhead (≥ 6.0 but ≤ 7.5)
	- Medium Sized Contemporary Bath
	- 5 Star WELS rated dishwasher and washing machine, if installed
	- 4 Star WELS rated toilets
NatHERS compliance	6.0 Star minimum NatHERS rating will be achieved for each Townhouse.
Clothesline	Clotheslines will be provided to all dwellings in the POS.
POS Ecology	Tap will be provided in every POS.
Solar PV	27kW solar PV system will be provided on the roof of the development. (equivalent to 3kW per dwelling).
HVAC System	Minimum 5-star efficient heating and cooling system chosen or within one star of the highest star rating possible depending on the product capacity.
Hot Water System	Electric instantaneous hot water system is provided to each dwelling.
Lighting	<ul style="list-style-type: none"> - Internal lighting for all dwellings will have a maximum illumination power density of 4W/sqm or less. - Energy efficient LED lights to be installed throughout.
Transport	<ul style="list-style-type: none"> - One bicycle space will be provided for each townhouse within garage – not over bonnet (for a total of 9).
Building Materials	<p>Low VOC paints, adhesives and sealants to be used.</p> <p>Aluminium framing for the windows.</p> <p>All the carpets, engineered timber and adhesives/sealants meet the Green-star Benchmark for VOC's and emissions.</p> <p>Use of engineered wood products of E1 or E0 grade (MDF, plywood, engineered-wood flooring).</p>
IEQ	Double Glazing or equivalent to be provided for all habitable areas.
	Appropriate external shading will be provided to east, west and north facing glazing.

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ESD Initiatives	
Proposed Residential Development	54 Ashley St, West Footscray VIC 3012
Category	Implementations
Waste	Each dwelling will be provided with a food/garden waste bin in addition to general waste and recycling bins.
	The recycling and general waste will be provided in the same storage area.
	The development is committed to recycling 80% of the construction and demolition waste.
Landscape	Water efficient landscaping to be installed.
	34% of the site area is covered with vegetation.
Urban heat island	Light or Medium coloured roof and driveway will be provided to mitigate urban heat island impact, where possible.

Table 1: ESD Initiatives

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1. Executive Summary

Hexicon has been engaged by Explode Pty Ltd to provide a Sustainable Design Assessment (SDA) for the proposed residential development at 54 Ashley St, West Footscray VIC 3012.

The development is within the jurisdiction of the City of Maribyrnong and for a development of this size, the council requires an SDA to be produced as part of its planning approval process. The requirements for an SDA are detailed on the Council website.


We have used BESS to support the proposed development planning application for ESD. The BESS (Built Environment Sustainability Scorecard) has been used to quantify all sustainable design criteria, with the exception of building materials. BESS is an online sustainability assessment tool purpose built for Sustainable Design Assessment in the planning process. The report summarises the sustainable design initiatives being incorporated in the proposed development and benchmarks them against industry best practice. The following table provides a summary of the BESS assessment targets and results for this project.

Categories	Minimum score required	Project's category score	Overall Contribution	Compliance
Management	-	0%	4.5%	-
Water	50%	50%	9.0%	PASS
Energy	50%	55%	27.5%	PASS
Stormwater	100%	100%	13.5%	PASS
Indoor Environment Quality (IEQ)	50%	60%	16.5%	PASS
Transport	-	66%	9.0%	-
Waste Management	-	50%	5.5%	-
Urban Ecology	-	62%	5.5%	-
Innovation	-	0%	9.0%	-
Overall BESS Score	50%	55%	(PASS - Best practice Standards)	

Table 2: BESS Score Card

Based on the above results, the project achieves the overall minimum passing score under the BESS assessment. This report describes an overall sustainable assessment and the ESD achievements of the proposed development.

The Sustainable Design Assessment is prepared to support the town planning application in accordance with the Clause 21.06-2 for Environmentally Sustainable Development and Clause 53.18 for Stormwater Management as mentioned in the City of Maribyrnong Planning Scheme.

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2. Project Overview

The proposed development at 54 Ashley St, West Footscray VIC 3012 has been covered in this SDA report consisting nine dwellings (9 x 3-bedrooms), being two (2) double storey dwellings & seven (7) triple storey dwellings. The following site plan indicates the location of the site.




Figure 1. Locality view of the subject site

3. Assessment and Documentation

This report is based on the following.

- Project discussions and email correspondences with Sue Zhang and Chris Bramham
- The architectural drawing sent by Sue Zhang dated on 21/09/2023

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4. Development Summary

Project Details	
Site Area (m ²)	1,615
No. of dwellings	9


Table 3: Project Details

To quantify the project's sustainability performance against an industry benchmark, this report uses the Built Environment Sustainability Scorecard (BESS), released by CASBE to support the Sustainable Design Assessment in the Planning Process (SDAPP) program.

BESS assesses overall environmental sustainability performance of building projects. It was created to assist builders and developers to demonstrate that they meet sustainability best practice standards as part of planning permit applications.

As part of the BESS assessment, we have used Melbourne Water's STORM calculator to assess stormwater score of the site.

Results from STORM were entered in BESS to support the assessment.

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5. Sustainability Categories

This SDA addresses the 10 sustainability categories in line with the BESS tool and overall best practice ESD assessment guidelines, noted in the table below.

No.	SDAPP ESD CATEGORIES	BENCHMARK
1	Energy Efficiency	BESS (mandatory 50%)
2	Water Efficiency	BESS (mandatory 50%)
3	Stormwater Management	BESS (mandatory 100%)
4	Indoor Environment Quality (IEQ)	BESS (mandatory 50%)
5	Waste Management	BESS
6	Transport	BESS
7	Innovation	BESS
8	Construction & Building Management	BESS
9	Urban Ecology	BESS
10	Building Materials	Industry best practice


Table 4: Categories showing BESS best practice assessment guidelines

For this assessment, categories 1 to 9 have been assessed using BESS tool while the 10th category, building material, has been assessed against industry best practice standards.

As noted above, the BESS tool sets out minimum standards to achieve compliance for the four major categories:

- Energy
- Water
- Stormwater (100%)
- Indoor Environment Quality (IEQ)

To comply, the development must achieve a minimum score of 50% in the categories mentioned above.

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6. ESD Assessment

The following is a summary of the ESD initiatives included in each of the BESS benchmark categories, as well as the scores obtained in the rating.

6.1 Management


We have not aimed to target any points in the management category.

6.2 Water

We propose to use, water efficient fixtures and fittings throughout the development. The following is a summary of the water efficiency features in the proposed development.

BESS Credit	Water Efficiency Features	Responsibility
1.1	To ensure the efficient use of water and thereby reduce total operating potable water use, fixtures & fittings will have the following WELS ratings.	Architect/Builder
	- 4 Star WELS showerhead (≥ 6.0 but ≤ 7.5)	
	- Medium Sized Contemporary Bath	
	- 5 Star WELS rated dishwasher and washing machine, if installed	
	- 4 Star WELS rated toilets	
	- 5 Star WELS kitchen & bathroom taps	
	To provide a 34% reduction in main water consumption, the building includes a rainwater harvesting tank and re-use system for each dwelling. 100% of the roof area drains to individual rainwater tank for each dwelling. Captured rainwater will be used for toilet flushing to all toilets within individual dwelling.	
3.1	Water efficient landscaping will be installed in the development. A water efficient garden should have no irrigation system and not require watering after an initial period when plants are getting established.	Landscape Architect
Final Water Score		50%

Table 5: Water Efficiency Features

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6.3 Energy Efficiency

Below is a summary of the energy efficiency features & specification for each dwelling. Generally, the strategy includes efficient building services and design features that contributes to low energy consumption and decrease the greenhouse gas emissions.

BESS Credit	Energy Efficiency Features	Responsibility
1.2, 2.1, 2.3, 3.2	Minimum 5-Star Efficient heating and cooling system chosen or within one star of the highest star rating possible depending on the product capacity. Reverse cycle space system is provided as the Heating and Cooling system.	Services Consultant
	Efficient instantaneous electric hot water system.	
	The development is committed to achieving 6.0-Star average across the development with no individual dwelling rated less than 6- Star.	ESD Consultant
2.6	The development will be all electric.	Builder
3.4	Clotheslines will be provided to all dwellings in the POS.	Builder
3.5	Internal lighting for all dwellings to have a maximum illumination power density of 4W/m ² or less.	
4.2	27kW solar PV system will be provided on the roof of the development (equivalent to 3kW per dwelling). This will offset a portion of greenhouse gas emissions and energy use for the project (lighting, pumps etc.).	Builder
Final Energy Score		55%

Table 6: Energy Efficiency Features

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6.4 Stormwater Management

BESS Credit	Stormwater Management Features			Responsibility
1.1	Melbourne water has developed the STORM calculator to provide an assessment of the rainwater/stormwater treatment methods and design score. This calculator assesses quality and quantity of the stormwater runoff from the development. The table below shows the Impervious area breakdown and the proposed treatment:			Builder
	Surface	Area (m ²)	Stormwater Treatment	
	Site Area	1,615		
	Roof Catchment Area to RWT	777	9 x 2,000L Rainwater harvesting tanks per dwelling (total of 18,000L of rainwater storage capacity in the development)	
	Impervious Driveway and other areas - Untreated	290	-	
	Pervious and Landscape Area	548	All Permeable areas are excluded from Stormwater assessment as they do not require any treatment	
	Final STORM rating		101%	
Final Stormwater Score			100%	

Table 7: Details for Stormwater Management

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The result of the stormwater assessment conducted is as per below:




STORM Rating Report

TransactionID: 0
 Municipality: MARIBYRNONG
 Rainfall Station: MARIBYRNONG
 Address: 54 Ashley St
 West Footscray
 VIC 3012
 Assessor: Hexicon - FC
 Development Type: Residential - Multiunit
 Allotment Site (m2): 1,615.00
 STORM Rating %: 101

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
Roof Catchment Area to RWT	777.00	Rainwater Tank	18,000.00	25	138.70	87.80
Impervious Driveway to Raingarden	290.00	None	0.00	0	0.00	0.00

Figure 2. Storm Rating Report

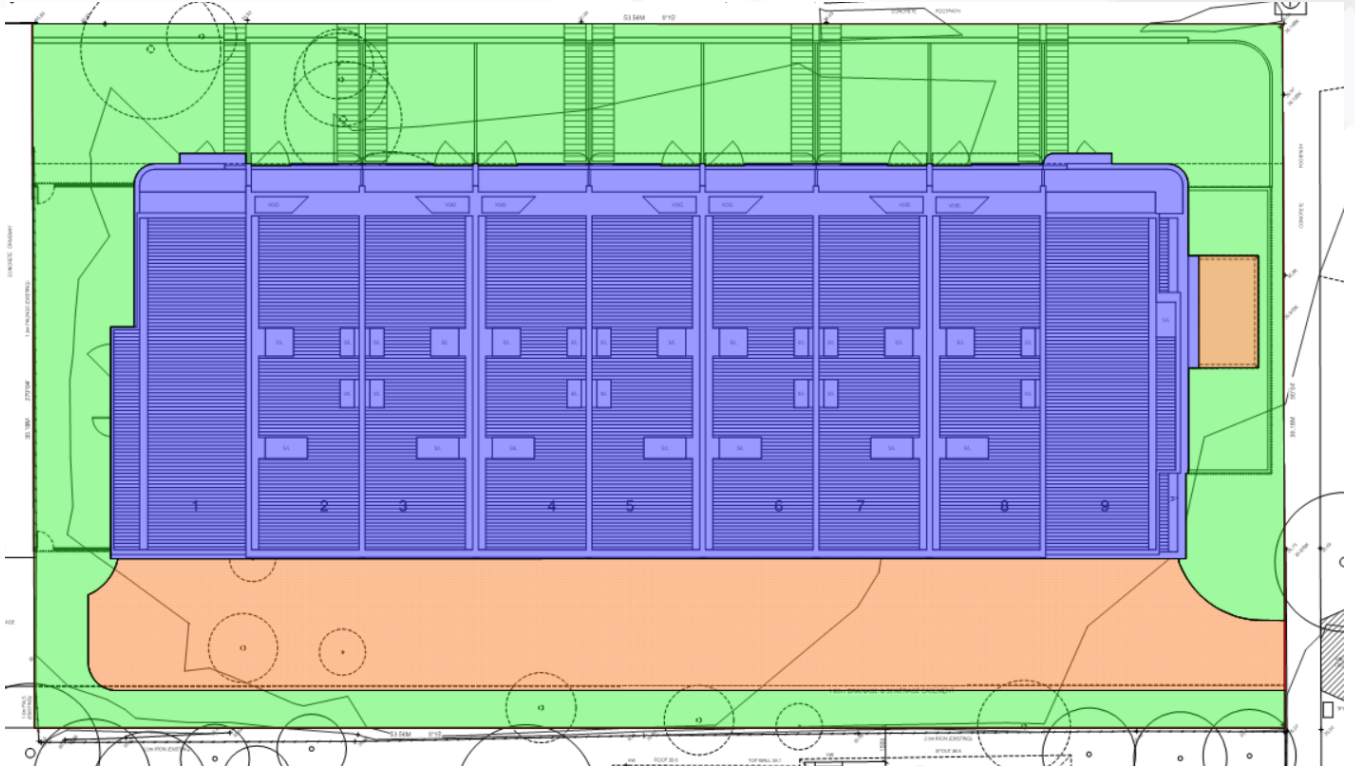
*The development has 3 bedrooms per dwelling (total 27). To obtain a representative number of it, 25 bedrooms have been entered in the STORM calculator to account for the toilets connection.

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Legend






	Description	Quantity	Unit
	Impervious Area - Driveway	290	sq m
	Pervious Area	548	sq m
	Roof Catchment Area to RWT	777	sq m
	Site Area	1,615	sq m

Figure 3. Area delineation for STORM assessment

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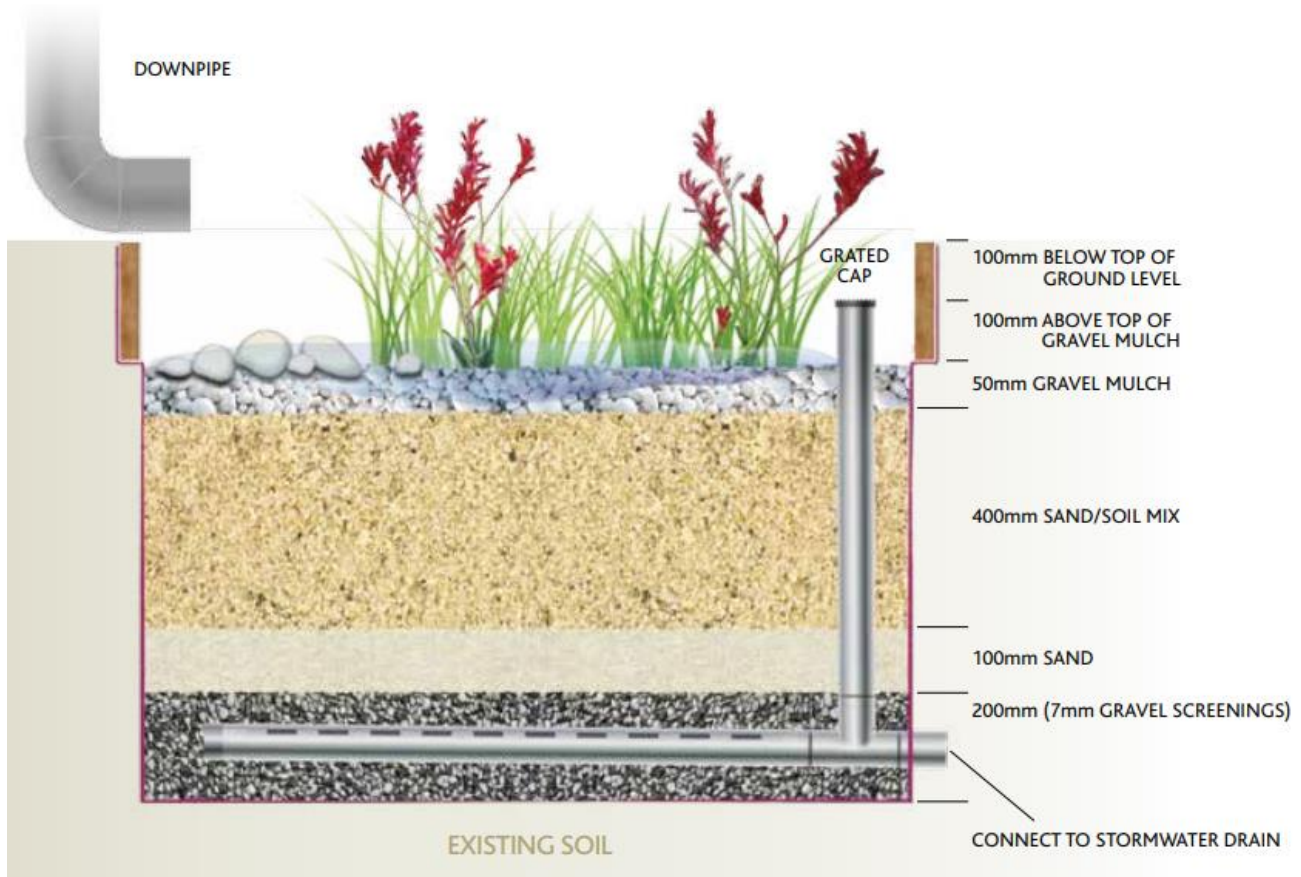



Figure 4: Typical Raingarden Detail (<https://www.melbournwater.com.au/>)

Please note that the above is subject to final drainage/civil/hydraulic design and location of the legal point of stormwater discharge. The full civil, hydraulic design and drainage plan will be carried out by the engineering consultants at the design development phase.

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6.5 Indoor Environment Quality

Below is a summary of the dwelling's performance against indoor environment quality benchmarks.

BESS Credit	Indoor Environment Quality Performance & Features	Responsibility
3.1	Double Glazing or equivalent to be provided for all habitable areas.	ESD Consultant & Architect
3.2	Shading will be provided to all habitable room windows. Horizontal fixed overhang shading will be provided to the North windows. In addition, vertical adjustable louvres will be provided to East and West facing glazing. This will be implemented to provide comfortable indoor spaces and reduce energy needed for heating and cooling.	ESD Consultant & Architect
Final IEQ Score		60%

Table 8: Indoor Environmental Quality Features

6.6 Transport

Below is a summary of the dwelling's performance against transport benchmarks.

BESS Credit	Transport Features	Responsibility
1.1	One bicycle space will be provided for each townhouse within garage – not over bonnet (for a total of 9).	Architect / Builder
2.1	Electric vehicle charging point will be provided in each garage to allow for future installation of EV chargers.	Builder
Final Transport Score		66%


Table 9: Transport Features

6.7 Waste Management

Below is a summary of the dwelling's performance against waste benchmarks.

BESS Credit	Waste Features	Responsibility
2.1	Each dwelling will be provided with a food/garden waste bin in addition to general waste and recycling bins. City of Maribyrnong now provide food/garden waste collection services.	Architect & Builder
-	The development is committed to recycling 80% of the construction and demolition waste.	Builder
Final Waste Management Score		50%

Table 10: Waste Management Features

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6.8 Urban Ecology

Below is a summary of Urban Ecology features used in the proposed development.

BESS Credit	Urban Ecology Features	Responsibility
2.1	The site is covered with at least 34% of vegetation in the proposed development	Landscape Architect & Architect
2.4	Tap and floor waste will be provided on every balcony / in every courtyard to encourage plants to be grown	Architect & Builder
Final Urban Ecology Score		50%

Table 11: Urban Ecology Features

6.9 Innovation


We have not aimed to target any points in the innovation category.

6.10 Building Material

BESS does not include a category dealing with sustainable building materials. As such, the project has reverted to the previous benchmark which was the STEPS tool. Refer to Appendix C for more information.

The following material specification achieves the minimum score under STEPS:

- Low VOC paints and sealants
- Aluminium framing for the windows
- All the carpets, engineered timber and adhesives/sealants meet the Green-star Benchmark for VOC's and emissions.
- Use of engineered wood products of E1 or E0 grade (MDF, plywood, engineered-wood flooring)
- Light colored roofs and concrete driveways are considered in the development to help mitigate the Urban heat island effect, where possible.

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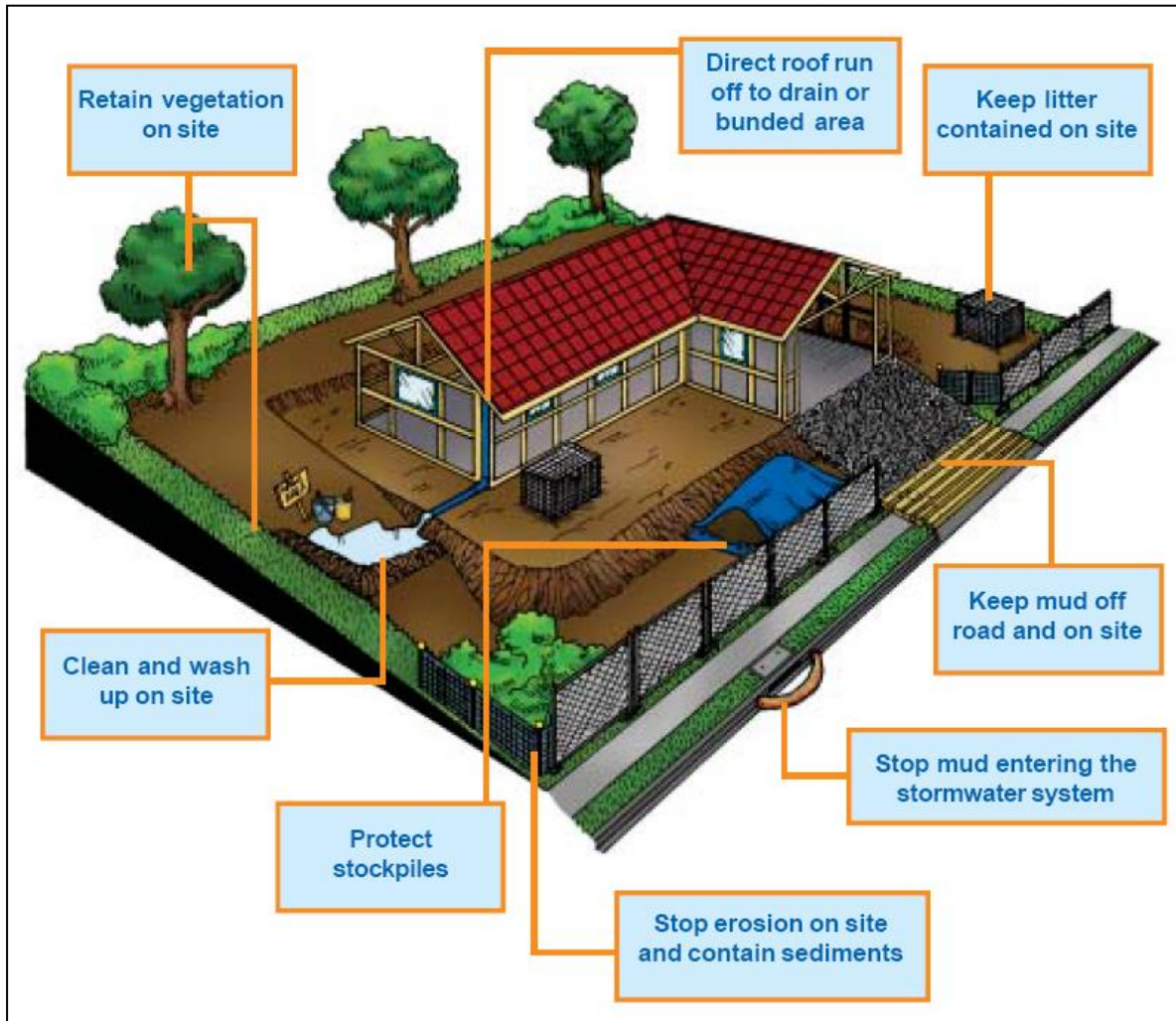
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7. Stormwater Management at Construction Site

To manage stormwater management in the construction stage, measures will be put in place to minimize the likelihood of contaminating stormwater. This will mean ensuring buffer strips are in place, sediment traps are installed, and the site will be kept clean from any loose rubbish. The builder will follow the process outlined in “Keeping Our Stormwater Clean – A Builder’s Guide”.



Copies of “Keeping Our Stormwater Clean – A Builder’s Guide” booklet can be obtained from Melbourne Water by ringing on 131 722 or can be downloaded from the following website.

<https://www.melbournewater.com.au/sites/default/files/Keeping-our-stormwater-clean-builders-guidelines.pdf>

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8. Conclusion

The project achieves all the minimum requirements under BESS, the new industry ESD best practice benchmark, achieving a rating of 55%. For items not covered by BESS, performance was shown to be in line with industry best practice. The proposed residential development located at 54 Ashley St, West Footscray VIC 3012 has a minimum scoring under the BESS assessment. The assessment results demonstrate that the design achieves the best practice standard established by the BESS.

The Sustainable Design Assessment is prepared to support the town planning application in accordance with the Clause 21.06-2 for Environmentally Sustainable Development and Clause 53.18 for Stormwater Management as mentioned in the City of Maribyrnong Planning Scheme.

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BESS Report

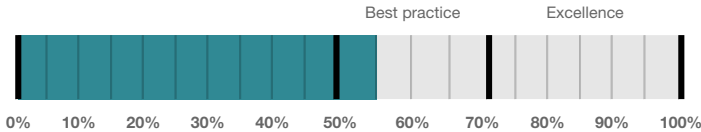
Built Environment Sustainability Scorecard



This BESS report outlines the sustainable design commitments of the proposed development at 54 Ashley St West Footscray Victoria 3012. 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 Maribyrnong City 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



55%

Project details

Address	54 Ashley St West Footscray Victoria 3012
Project no	69C9A350-R1
BESS Version	BESS-7
<hr/>	
Site type	Multi dwelling (dual occupancy, townhouse, villa unit etc)
Account	esd@hexicon.com.au
Application no.	
Site area	1,615.00 m ²
Building floor area	361.00 m ²
Date	02 November 2023
Software version	1.8.0-B.403



Performance by category

● Your development ● Maximum available

Category	Weight	Score	Pass
Management	5%	0%	*
Water	9%	50%	✓
Energy	28%	55%	✓
Stormwater	14%	100%	✓
IEQ	17%	60%	✓
Transport	9%	66%	*
Waste	6%	50%	*
Urban Ecology	6%	62%	*
Innovation	9%	0%	*

Dwellings & Non Res Spaces

Dwellings

Name	Quantity	Area	% of total area
Townhouse			
Units 2-8	7	34.0 m ²	65%
Unit 9	1	65.0 m ²	18%
Unit 1	1	58.0 m ²	16%
Total	9	361 m²	100%

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Water 3.1	Annotation: Water efficient garden details		-
Energy 3.4	Location of clothes line (if proposed)		-
Energy 4.5	Location and size of solar photovoltaic system		-
Stormwater 1.1	Location of any stormwater management systems (rainwater tanks, raingardens, buffer strips)		-
IEQ 3.1	Annotation: Glazing specification (U-value, SHGC)		-
IEQ 3.2	Adjustable shading systems		-
Transport 1.1	Location of residential bicycle parking spaces		-
Transport 2.1	Location of electric vehicle charging infrastructure		-
Waste 2.1	Location of food and garden waste facilities		-
Urban Ecology 2.1	Location and size of vegetated areas		-
Urban Ecology 2.4	Location of taps and floor waste on balconies / courtyards		-

Supporting evidence

Credit	Requirement	Response	Status
Energy 3.5	Average lighting power density and lighting type(s) to be used		-
Energy 4.5	Specifications of the solar photovoltaic system(s)		-
Stormwater 1.1	STORM report or MUSIC model		-
IEQ 3.1	Reference to floor plans or energy modelling showing the glazing specification (U-value and Solar Heat Gain Coefficient, SHGC)		-
IEQ 3.2	Reference to floor plans and elevations showing shading devices		-

Credit summary

Management Overall contribution 4.5%

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

Water Overall contribution 9.0%

		Minimum required 50%	50%	✔ Pass
1.1 Potable Water Use Reduction			40%	
3.1 Water Efficient Landscaping			100%	

Energy Overall contribution 27.5%

		Minimum required 50%	55%	✔ Pass
1.2 Thermal Performance Rating - Residential			0%	
2.1 Greenhouse Gas Emissions			100%	
2.2 Peak Demand			0%	
2.3 Electricity Consumption			100%	
2.4 Gas Consumption			N/A	✦ Scoped Out
No gas connection in use				
2.5 Wood Consumption			N/A	✦ Scoped Out
No wood heating system present				
2.6 Electrification			100%	
3.2 Hot Water			100%	
3.3 External Lighting			0%	
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			100%	

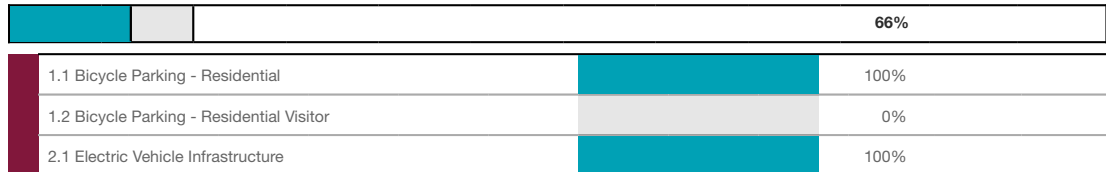
Stormwater Overall contribution 13.5%

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

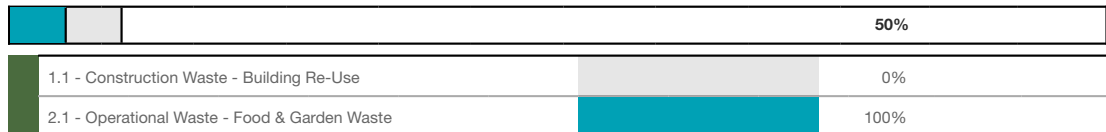
IEQ Overall contribution 16.5%

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

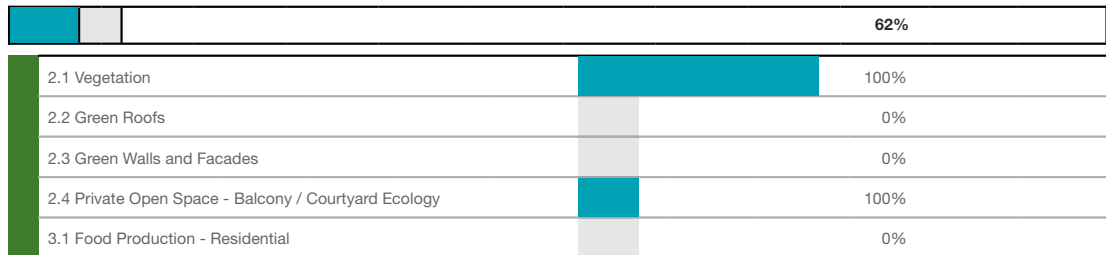
Transport Overall contribution 9.0%



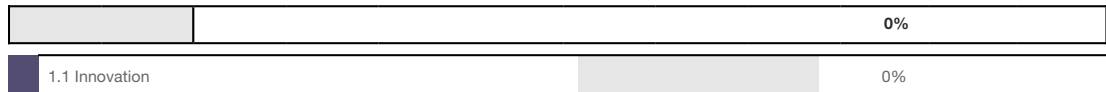
Waste Overall contribution 5.5%



Urban Ecology Overall contribution 5.5%



Innovation Overall contribution 9.0%



Credit breakdown

Management Overall contribution 0%

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	0%
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	No
4.1 Building Users Guide	0%
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	No



Water Overall contribution 4% 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	>= 5 Star WELS rating
WC: All	>= 4 Star WELS rating
Urinals: All	Scope out
Washing Machine Water Efficiency: All	>= 5 Star WELS rating
Which non-potable water source is the dwelling/space connected to?: All	Tanks 1-9
Non-potable water source connected to Toilets: All	Yes
Non-potable water source connected to Laundry (washing machine): All	No
Non-potable water source connected to Hot Water System: All	No
Rainwater Tank	
What is the total roof area connected to the rainwater tank?: Tanks 1-9	777 m ²
Tank Size: Tanks 1-9	18,000 Litres
Irrigation area connected to tank: Tanks 1-9	0.0 m ²
Is connected irrigation area a water efficient garden?: Tanks 1-9	No
Other external water demand connected to tank?: Tanks 1-9	-

1.1 Potable Water Use Reduction		40%
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	704 kL	
Output	Proposed (excluding rainwater and recycled water use)	
Project	523 kL	
Output	Proposed (including rainwater and recycled water use)	
Project	460 kL	
Output	% Reduction in Potable Water Consumption	
Project	34 %	
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	187 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 15% 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)?:	Yes
Are you installing any other renewable energy system(s)?:	No
Energy Supply:	All-electric
Dwelling Energy Profiles	
Below the floor is: All	Ground or Carpark
Above the ceiling is: All	Outside
Exposed sides:	
Unit 1	3
Unit 9	
Units 2-8	2
NatHERS Annual Energy Loads - Heat: All	126 MJ/sqm
NatHERS Annual Energy Loads - Cool: All	31.0 MJ/sqm
NatHERS star rating: All	6.0
Type of Heating System: All	Reverse cycle space
Heating System Efficiency: All	5 Star
Type of Cooling System: All	Refrigerative space
Cooling System Efficiency: All	5 Stars
Type of Hot Water System: All	Electric Instantaneous
% Contribution from solar hot water system: All	-
Clothes Line: All	Private outdoor clothesline
Clothes Dryer: All	Occupant to Install
Solar Photovoltaic system	
System Size (lesser of inverter and panel capacity): PV 1-9	27.0 kW peak
Orientation (which way is the system facing)?: PV 1-9	North
Inclination (angle from horizontal): PV 1-9	15.0 Angle (degrees)
1.2 Thermal Performance Rating - Residential 0%	
Score Contribution	This credit contributes 30.0% towards the category score.
Criteria	What is the average NatHERS rating?
Output	Average NATHERS Rating (Weighted)
Townhouse	6.0 Stars

2.1 Greenhouse Gas Emissions		100%
Score Contribution	This credit contributes 10.0% 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	40,415 kg CO2	
Output	Proposed Building with Proposed Services (Actual Building)	
Townhouse	15,384 kg CO2	
Output	% Reduction in GHG Emissions	
Townhouse	61 %	
2.2 Peak Demand		0%
Score Contribution	This credit contributes 5.0% 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	91.2 kW	
Output	Peak Thermal Cooling Load - Proposed	
Townhouse	96.5 kW	
Output	Peak Thermal Cooling Load - % Reduction	
Townhouse	-6 %	
2.3 Electricity Consumption		100%
Score Contribution	This credit contributes 10.0% towards the category score.	
Criteria	What is the % reduction in annual electricity consumption against the benchmark?	
Output	Reference	
Townhouse	39,622 kWh	
Output	Proposed	
Townhouse	15,082 kWh	
Output	Improvement	
Townhouse	61 %	
2.4 Gas Consumption		N/A  Scoped Out
This credit was scoped out	No gas connection in use	
2.5 Wood Consumption		N/A  Scoped Out
This credit was scoped out	No wood heating system present	
2.6 Electrification		100%
Score Contribution	This credit contributes 10.0% towards the category score.	
Criteria	Is the development all-electric?	
Question	Criteria Achieved?	
Project	Yes	

3.2 Hot Water		100%
Score Contribution	This credit contributes 5.0% 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	70,403 MJ	
Output	Proposed	
Townhouse	30,465 MJ	
Output	Improvement	
Townhouse	56 %	
3.3 External Lighting		0%
Score Contribution	This credit contributes 5.0% towards the category score.	
Criteria	Is the external lighting controlled by a motion detector?	
Question	Criteria Achieved ?	
Townhouse	No	
3.4 Clothes Drying		100%
Score Contribution	This credit contributes 5.0% 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	2,768 kWh	
Output	Proposed	
Townhouse	554 kWh	
Output	Improvement	
Townhouse	79 %	
3.5 Internal Lighting - Houses and Townhouses		100%
Score Contribution	This credit contributes 5.0% 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% <input type="checkbox"/> Disabled
This credit is disabled	No other (non-solar PV) renewable energy is in use.	

4.5 Solar PV - Houses and Townhouses		100%
Score Contribution	This credit contributes 10.0% towards the category score.	
Criteria	What % of the estimated energy consumption of the building class it supplies does the solar power system provide?	
Output	Solar Power - Energy Generation per year	
Townhouse	33,599 kWh	
Output	% of Building's Energy	
Townhouse	222 %	

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		0%
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	No	
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		100%
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	Yes	
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	9	
Output	Min Bicycle Spaces Required	
Townhouse	9	
1.2 Bicycle Parking - Residential Visitor		0%
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	0	
2.1 Electric Vehicle Infrastructure		100%
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	Yes	

Waste Overall contribution 3%

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		100%
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	Yes	

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	34 %
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	100%
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	Yes
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	3 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)?

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Appendix B – WSUD Maintenance Plan


This section of the document outlines the key inspection and maintenance activities for each stormwater treatment asset type and is based on Melbourne Water’s WSUD Maintenance Guidelines. The implementation of the maintenance program is the responsibility of the owner’s corporation. The Gross Pollutant Trap is considered in the development to prevent harmful sediments and pollutants to enter in the water. GPT maintenance is included in the following plan with Owner’s responsibility and arranging regular servicing by the GPT company provider.

B.1 Rainwater Harvesting Tanks

Rainwater harvesting tanks typically collect rainwater from a building’s roof or other surface relatively free of pollutants. Captured rainwater can generally be re-used for toilet flushing and landscape irrigation with minimal treatment required.

The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Roof	<ul style="list-style-type: none"> - Remove leaf litter and debris - Check general condition of roof for signs of leakage, including broken tiles, and rusting 	1 month
Gutters and Downpipes	<ul style="list-style-type: none"> - Remove leaf litter and gross pollutants - Check general condition of drainage systems for signs of leakage, including damaged pipes and rusting 	1 month
First Flush Device	<ul style="list-style-type: none"> - Inspect inlet screens for blockages or fouling - Inspect silt traps and collection pits, clean as required - Inspect diversion pit and remove any build-up of sludge blocking the diversion valve - Check all float operations and activation switches (if applicable) - Check general condition of components for loose connections, wear and tear, and signs of leakage 	1 - 3 months
	<ul style="list-style-type: none"> - Arrange licensed EPA contractor to remove built-up sludge accrued in all pits (if applicable) 	6 months
Tanks	<ul style="list-style-type: none"> - Ensure inlet and overflow screens are not blocked or fouled - Remove excess layers of sludge and biofilms on tank walls if affecting the color or smell of the tank water - Check general condition of tank for signs of damage or leakage 	3 – 6 months
Pumps	<ul style="list-style-type: none"> - Pumping systems are to be maintained in accordance with the manufacturers’ specifications 	Refer manufacturers’ details

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Component	Key Activities	Typical Frequency
Vegetation	<ul style="list-style-type: none"> - Prune surrounding vegetation and overhanging trees to reduce leaf litter and debris. 	6 months

B.2 Raingardens

Raingardens, also known as bioretention systems, biofilters, bio-infiltration systems and bioremediation systems, are vegetated infiltration systems that improve stormwater quality. Stormwater ponds on the raingarden surface, slowly infiltrates through the filter media to the base of the system and is then conveyed to the downstream drainage system. Pollutants such as nitrogen, phosphorus and suspended solids are removed as stormwater passes through the filter media. The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Filter Media	<ul style="list-style-type: none"> - Remove leaf litter and gross pollutants - Check for biofilms (algal biofilms may develop on the surface of filter media leading to clogging issues) - Monitor ponding of water following rainfall events - Check for permanently boggy/pooled areas 	3 months & following storm events
	<ul style="list-style-type: none"> - Remove sediment (or scarify filter media surface if required) 	Annually
Erosion	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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) 	3 months

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B.3 Tree Pit

Tree pits are mini raingardens that comprise of a tree or large shrub planted within an underground planting module (pit). Stormwater runoff from catchment areas including roads, car parks and pavements is directed to the tree pits, where it is both treated and used to passively irrigate the street trees. Similar to raingardens, tree pits comprise of a combination of media layers that allow stormwater to slowly infiltrate from the surface of the tree pit down to the underdrain system where it is discharged to the stormwater drainage system. In some situations, the tree pit may have a pervious base, and water is infiltrated directly to the surrounding soils. The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Filter Media	<ul style="list-style-type: none"> - 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 the ponding of water following rainfall events. 	3 months & following storm events
	<ul style="list-style-type: none"> - Remove accumulated sediment (or scarify filter media surface if required). 	Annually
Mulch	<ul style="list-style-type: none"> - Check depth and even distribution of mulch layer. - Check mulch is not touching the tree trunk. - Replace mulch (if required). - Check for sediment/silt accumulation within mulch layer. 	3 months
Vegetation	<ul style="list-style-type: none"> - Inspect plant health (signs of disease, pests, poor growth). - Check plant stability (tree supports). - Remove weeds (avoid use of herbicides). - Prune plants (where applicable). - Water plants (if required during establishment phase). 	3 months
Civil Components	<ul style="list-style-type: none"> - Inspect for physical damage, concrete cracking and subsidence (sinking). - Ensure inlet and outlet points are clear of sediment, litter and debris. 	3 months & following storm events
	<ul style="list-style-type: none"> - Inspection opening: <ul style="list-style-type: none"> o Check the underdrain (slotted drainage pipe) system for standing water or sediment accumulation. o Flush the underdrain system (if required). 	Annually

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B.4 Swales

Conventional swales are simple vegetated channels that convey stormwater and provide stormwater treatment through filtration and infiltration. Bioretention swales (bio-swales) comprise of a channel with vegetation, layers of filter media and slotted drainage pipes (underdrain) arranged in a similar layout to a raingarden. Bio-swales facilitate more infiltration than conventional swales and therefore provide a higher level of treatment. The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Erosion	<ul style="list-style-type: none"> - Check for erosion/scouring. - Check for preferential flow paths. - Replace soil/filter media in eroded areas. - Replant eroded areas. 	3 months
Vegetation	<ul style="list-style-type: none"> - Inspect plant health and cover. - Prune plants (where applicable). - Mow. - Remove weeds (avoid use of herbicides). - Replace dead plants (maintain a consistent vegetation density of 6–10 plants per sqm for bio-swales). - Water plants (if required during establishment phase). 	3 months
Sediment Accumulation	<ul style="list-style-type: none"> - Check for sediment accumulation (if not intended by design). - Remove sediment (if required). - Monitor ponding of water following rainfall events. - Check for permanently boggy/pooled areas. 	Annually

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B.5 Permeable Paving

Permeable pavements allow stormwater runoff to infiltrate to underlying soils rather than running off hard surfaces and into the stormwater drainage system. Permeable pavements are used for a wide range of purposes including:

- Reducing stormwater runoff volumes
- Reducing sediment and pollutant loads discharged to local waterways
- Enhancing groundwater recharge
- Retarding stormwater runoff (where underdrains are present)
- Water harvesting and re-use.


The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Paving Surface	<ul style="list-style-type: none"> - Check for accumulated sediment. - Sweep, wet vacuum or pressure hose the surface of the pavers to remove clogging material. - Check infill material is present between pavers. - Monitor ponding of water following rainfall events. 	3 months & following storm events
Bedding Material	<ul style="list-style-type: none"> - Check level of the pavement surface 	Annually
Underdrain	<ul style="list-style-type: none"> - Check inspection openings for sediment accumulation. - Flush underdrain to remove sediment (if required). 	Annually

B.6 Proprietary Stormwater Treatment Devices

Several proprietary treatment systems are currently available on the market. These systems come in a range of sizes and can target specific stormwater pollutants depending on the project's requirements. Example treatment systems include products such as Enviss Sentinel Pits, SPEL Stormceptor, Stormwater Management Storm Filter and Ecosol Sand Filters. The following provides a guide to the timing of inspection and maintenance activities for the typical components of this system.

Component	Key Activities	Typical Frequency
Stormwater Treatment Asset	<ul style="list-style-type: none"> - Assets are to be maintained in accordance with the manufacturers' specifications 	Refer manufacturers' details

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Appendix C – VOC & Formaldehyde Emission Limits

The following table are an extract of the Green Star Design and as built submission guidelines:


Table 13.1.1: Maximum TVOC Limits for Paints, Adhesives and Sealants

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

The product complies with the Total VOC (TVOC) limits specified in the Table below.

Carpet Test Standards and TVOC Emissions Limits

Test protocol	Limit
ASTM D5116 - Total VOC limit	0.5mg/m ² per hour
ASTM D5116 - 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	0.5mg/m ² per hour

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Table 13.2: Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	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

*mg/m²hr may also be represented as mg/m²/hr.

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