

CIVIL ENGINEERING SERVICES REPORT

PROPOSED MULTI-UNIT RESIDENTIAL DEVELOPMENT AT
8 OUTRIDGE STREET AND 69 & 71 BANANA STREET, REDLAND BAY

New Fortune Investments

AMENDED IN RED

By: Jocelyn Bowyer

Date: 23/08/2023



PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2022/1349

Date: 15/12/2023



LAMBERT & REHBEIN
ENGINEERS • MANAGERS • SCIENTISTS

Table of Contents

1.	INTRODUCTION	3
2.	SITE DESCRIPTION	4
3.	EARTHWORKS.....	5
4.	ROADWORKS & ACCESS	6
5.	STORMWATER DRAINAGE.....	7
6.	SEWERAGE AND WATER RETICULATION.....	14
7.	ELECTRICITY & TELECOMMUNICATION SERVICES	15
8.	CONCLUSION.....	16
APPENDIX A – DEVELOPMENT LAYOUT PLANS BY HAYES ANDERSON LYNCH ARCHITECTS.....		17
APPENDIX B – CONCEPTUAL CIVIL ENGINEERING PLAN.....		18

Revision	Date	Description	Author	Verifier	Approver
A	24/08/2022	ORIGINAL ISSUE	MB	AP	AP
B	12/10/2022	UPDATED ARCHITECTURAL	MB	AP	AP
C	12/10/2022	ISSUE FOR APPROVAL	MB	AP	AP
D	24/04/2023	RFI RESPONSE	MB	AP	AP

Authorised by: Andrew Pezzutti, For and on behalf of Lambert & Rehbein (SEQ) Pty Ltd



Position: Civil Division Manager

RPEQ No.: 6382

1. INTRODUCTION

Lambert & Rehbein (SEQ) Pty Ltd has been commissioned by New Fortune Investments to prepare a Civil Engineering Services Report for a proposed multi-unit residential development at 8 Outridge Street and 69 & 71 Banana Street, Redland Bay.

The project includes the amalgamation of the existing residential lots and construction of a multi-storey residential apartment building with a childcare centre at ground level and underground parking. The proposed lot layout plan prepared by Hayes Anderson Lynch Architects is enclosed in **Appendix A** of this report.

This report has been prepared to review existing services within the vicinity of the subject site and identify possible arrangements to service the proposed development. Concept Civil Engineering Servicing Layout Plans have been prepared and are enclosed in **Appendix B** to illustrate the proposed servicing arrangements for the development.

2. SITE DESCRIPTION

The subject site is located at 8 Outridge Street and 69 & 71 Banana Street, Redland Bay, formally described as Lots 14, 15 and 16 on RP80201. The site is bound by Lot 13 on RP8021 to the north, Outridge Street to the west, Meissner Street to the south and Banana Street to the east. The site has an approximate site area of 2,422 square metres.



Figure 2.1. Site Locality

Source: QLD Globe 2022

The site is currently occupied with a single dwelling and ancillary structures on each lot. The site grades from the west to east across the site, falling from approximately 3.0m AHD to 2.0m AHD. The site is located within the Weinam Creek Priority Development Area, identified by Economic Development Queensland.

3. EARTHWORKS

It is proposed to perform bulk earthworks to construct a suitable foundation for the development and excavate for the proposed basement car parking. As such, retaining for the basement car parking will form part of the building works. All earthworks for the development will be carried out in accordance with Redland City Council requirements and the AS3798-2007 Guidelines on Earthworks for Commercial and Residential Developments.

Concept civil plans have been prepared and are enclosed in **Appendix B** of this report to illustrate bulk earthworks and anticipated servicing arrangements for the proposed development. It should be noted that this plan is preliminary only and will be subject to confirmation during detailed design.

4. ROADWORKS & ACCESS

The site has frontages to Outridge Street, Meissner Street and Banana Street, all being fully sealed roads with kerb and channel. It is proposed to demolish all existing crossovers and construct a new Type 'B1' crossover along Outridge Street to provide suitable access to the site and basement car parking. It is not anticipated that any major roadworks will be required as part of this development.

The landscape concept master plan prepared by 02LA approved by Economic Development Queensland on the 22nd December 2021 identifies that streetscape works will be required as part of the development, constructing a new concrete footpath along the frontages of Meissner Street and Banana Street.

A concept civil servicing plan has been prepared and is enclosed in **Appendix B** to illustrate the proposed servicing arrangements for the development. It should be noted that these plans are preliminary only and will be subject to confirmation during detailed design.

5. STORMWATER DRAINAGE

5.1 STORMWATER QUANTITY ASSESSMENT

The site is located within the Weinam Creek catchment and discharges directly to Moreton Bay via the adjacent marina to the south of the site. Redland City Council online asset mapping identifies that there is an existing stormwater connection for the site near the south-eastern corner of the site, on the corner of Banana Street and Meissner Street. It is anticipated to maintain existing discharge arrangements for the site and discharge site generated runoff to the existing identified gully pit.

A review of the development site shows that the site has large impervious areas currently used as carparking, as well as large roof areas covering the site. It is anticipated that the increase of impervious area to the site as a result of the development will have no appreciable impact on the downstream drainage system. Furthermore, site flows are discharged directly to Moreton Bay approximately 47m south-east of the site. As such, it is not anticipated that the development will cause any appreciable impact to stormwater conditions in this area and thus it is the opinion of Lambert & Rehbein that detention will not be required as part of this development.

5.2 STORMTIDE MANAGEMENT ASSESSMENT

Redland City Council iDevelopment property enquiry of the existing lots identifies that the maximum predicted storm tide level at Year 2100 is approximately 3.22m AHD. The EDQ PDA Guideline 15: Protection from flood and storm tide inundation Table 2 identifies that habitable floor levels must achieve a minimum 300mm freeboard from the storm tide inundation level. As such, below provides the minimum design levels for various components of the development:

Use	Minimum Freeboard Requirement	Min Design Level
Basement Entry	2100 Stormtide level + 50mm freeboard	3.27m AHD
Commercial Use or Non-Habitable	2100 Stormtide Level	3.22m AHD
Apartments - Habitable	2100 Stormtide level + 300mm freeboard	3.52m AHD

The site is identified as being within a coastal erosion prone area and the development is consistent with the intentions for the proposed zoning for the precinct. The use of backflow prevention devices may also be required to ensure backflow from tidal waters do not impact the internal stormwater or roofwater drainage. It is anticipated that risks to the development structure and infrastructure will be minimised through design.

Civil engineering plans have been prepared by Lambert & Rehbein and are enclosed in **Appendix B** of this report to illustrate the proposed stormwater management approach for the development. It should be noted that these plans are preliminary only and will be subject to confirmation during detailed design.

5.3 STORMWATER QUALITY

5.3.1 STORMWATER QUALITY TRIGGER ASSESSMENT

Although the development does not trigger the State Planning Policy Water Quality requirements as there are less than six new lots being recreated and the disturbance due to the development is less than 2,500 square metres, it is recognised that as Redland Bay is an emerging area adjacent to the marina, stormwater quality treatment is to be provided to minimise the adverse impact on the underlying natural ecosystem in the coastal waters, in accordance with the Coastal Plan Nature Conservation PO28 and EDQ Guideline 14 Wetland and Waterways Value 3: Water Quality Strategies.

5.3.2 STORMWATER QUALITY OBJECTIVES

In accordance with the Queensland DILGP State Planning Policy (2017), the required operational phase Water Quality Objectives (WQOs) are provided in **Table 5.1** below.

Table 5.1 Operational Phase Water Quality Objectives

POLLUTANT	WQO PERCENTAGE LOAD REDUCTIONS
Total Suspended Solids (TSS)	80%
Total Phosphorous (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	90%

5.3.3 POTENTIAL WATER QUALITY IMPACTS

The following impacts have been identified in relation to stormwater runoff and water quality of the receiving waterways, as a result of proposed operations on site:

- Potential exists for gross pollutants, which include human derived litter, coarse sediment and vegetation, to affect the drainage capacity of stormwater systems. Gross pollutants may physically affect the downstream waterway habitats and organisms such as entangling birds and aquatic animals. Gross pollutants are also typically unsightly and reduce the visual amenity of the site;
- Sediment can become mobilised by stormwater as suspended solids from the erosion of exposed soil areas, un-mulched garden beds, sediment deposited on car park and hardstand areas by vehicles and by atmospheric deposition of sediment. Suspended solids can be used as a transport medium resulting in nutrients and heavy metals making their way into waterways. Suspended solids can block stormwater systems leading to local flooding and can also affect receiving waterways physically through smothering aquatic flora and fauna; and
- Nutrients can enter waterways in stormwater runoff through many sources including detergents used in car washing, fertilizers from landscaping and lawn areas, nitrous oxide deposition from vehicle exhausts, and organic waste. High nutrient levels can lead to eutrophication of the receiving waterways resulting in algal blooms (toxic in some cases) and excessive macrophyte growth.

Implementation of the appropriate Stormwater Quality Improvement Devices (SQIDs) would ensure that stormwater discharge from the site would adhere to Brisbane City Council's requirements and objectives.

5.3.4 STORMWATER QUALITY ASSESSMENT

The potential impact and effectiveness of the proposed SQIDs was assessed using MUSIC Version 6.3. MUSIC is a software tool that simulates stormwater runoff quality from different sources and the effectiveness of SQIDs.

The MUSIC modelling program is able to simulate the quantity and quality of stormwater runoff from catchment sizes which range from a single house lot up to 100 km². The program is able to report on the pollution uptake efficiencies of a wide range of treatment measures.

The model can be used to generate both pollutant concentrations and long term pollutant loads and is recognised as the most appropriate modelling software for the planning of stormwater treatment measures for urban catchments.

5.3.4.1 General Music Modelling Approach

MUSIC modelling was conducted generally in accordance with the Healthy Waterways Water by Design “MUSIC Modelling Guidelines, Version 1.0, 2010”. The MUSIC guidelines suggest that the timestep of each model should match the time of concentration of the smallest source node and the smallest detention time of any treatment devices. As WSUD principles are to be applied, a six (6) minute timestep should be adopted to match the range of treatments incorporated and the low time of concentrations expected from the catchment.

Rainfall and mean monthly Potential Evapotranspiration (PET) data was sourced from the Bureau of Meteorology Redland City Council HRS (Stn. Number: 40265): from 1997 to 2006 inclusive and was applied to all modelling scenarios. **Table 5.2** below details the MUSIC parameters utilised in running the model.

Table 5.2 MUSIC Model Hydrological Parameters

PARAMETER	DESCRIPTION
Meteorological Data	Bureau of Meteorology Redland City Council HRS (Stn. Number: 40265): from 1997 to 2006 inclusive
Source Node	Urban Residential
Modelling Time Step	6 minute
Drainage Link	No Routing
Pollutant Concentration	Urban Residential
Rainfall-Runoff Properties	Urban Residential

The MUSIC model defaults of k and C* assist in the definition of treatment performance and are based on research and judgement by academics and industry leaders assisting the eWater Cooperative Research Centre (CRC). The k constant is used in a first order kinetic model to simulate the removal of pollutants within the treatment system. C* values represent the background concentrations of pollutants for end of line treatment measures. All modelling for this study has used the default values for k and C*.

5.3.4.2 Proposed Site Catchments

A review of the development displayed in the development plans prepared by Hayes Anderson Lynch Architects, enclosed in **Appendix A**, was undertaken to determine an appropriate stormwater quality modelling approach.

MUSIC models the rainfall-runoff and pollutant generation processes within a source node with unique pollutant export parameters for each different land use type. As required by the Water by Design, MUSIC Modelling Guidelines Version 1.0 (2010), the development was modelled using a “split catchment approach”, where each surface of the development is separated based on its land use.

The majority of the site will be conveyed to the proposed stormwater treatment system, located near the entrance of the site. There is a portion of the site however that will be captured and discharged to the new Council pipe that will not receive treatment. **Table 5.3** overleaf shows the catchment land-use breakdown used in the MUSIC model.

Table 5.3 Proposed Development Catchment Areas

DESCRIPTION	AREA				TOTAL
	Roof (100%)	Road (100%)	Ground (100%)	Landscape (0%)	
SITE	0.109	0.016	0.073	0.044	0.242 Ha

Figure 5.1 shows a representation of the various land-use types considered in the MUSIC model. It is noted that the roof has walkable areas and landscaping thus portions of the roof area are considered with different land use types such as ground and landscaping as shown on **Figure 5.1**.

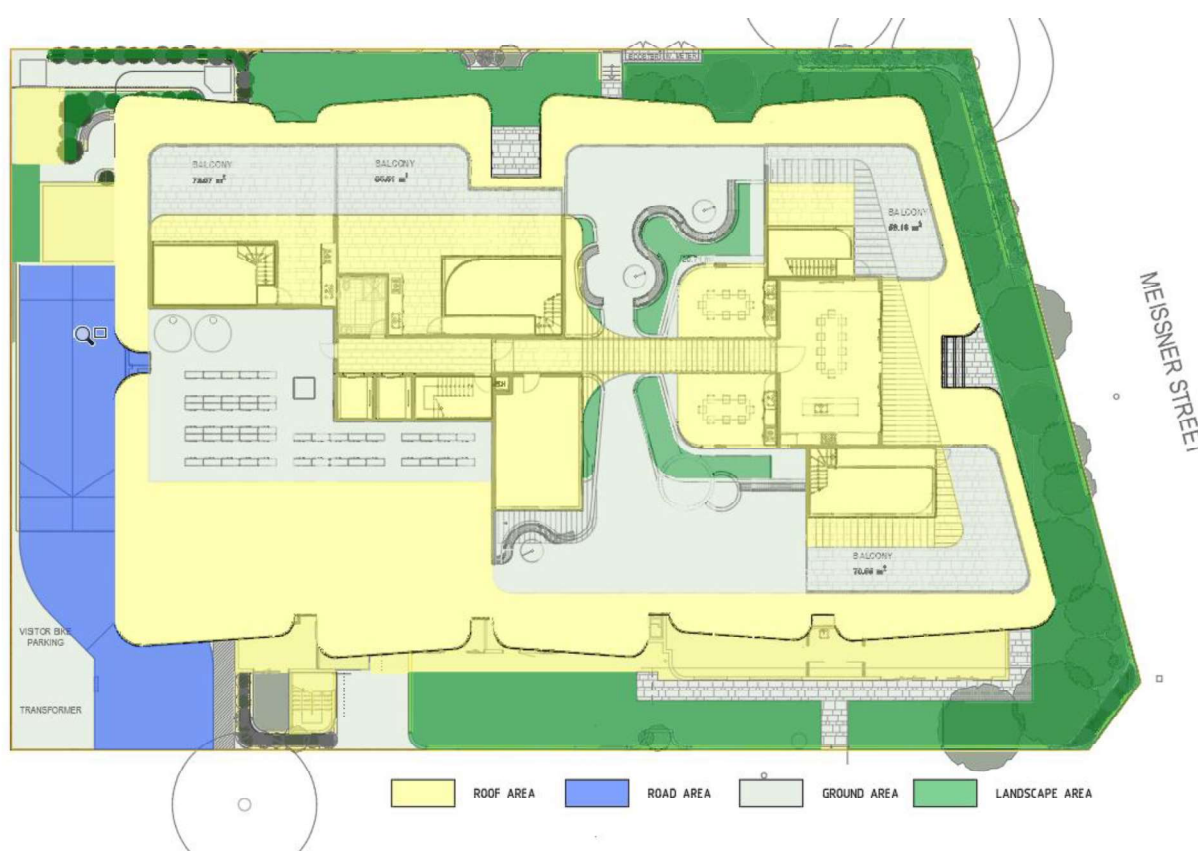


Figure 5.1. MUSIC Land-Use Catchments

Given the nature of the development, the identified sub catchments were modelled with Urban Residential source node parameters as per the Healthy Waterways Water by Design "MUSIC Modelling Guidelines Version 1.0, 2010". These parameters are presented in **Table 5.4** and **Table 5.5**.

Table 5.4 MUSIC Rainfall-Runoff Parameters

POLLUTANT	LAND USE		
	Urban Residential	Industrial	Commercial Urban
Rainfall Threshold (mm)	1	1	1
Soil Storage Capacity (mm)	500	18	18
Initial Storage (%)	10	10	10
Field Capacity (mm)	200	80	80
Infiltration Capacity Coefficient a	211	243	243
Infiltration Capacity Exponent b	5.0	0.60	0.60
Initial Depth (mm)	50	50	50
Daily Recharge Rate (%)	28	0	0
Daily Baseflow Rate (%)	27	31	31
Daily Deep Seepage Rate (%)	0	0	0

Source: Water by Design “MUSIC Modelling Guidelines”, Version 1.0, 2010

Table 5.5 Pollutant Export Parameters Adopted in the MUSIC model

POLLUTANT			LAND USE					
			Urban Residential		Industrial		Commercial Urban	
			Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Total Suspended Solids	Roof	Base Flow	N/A	N/A	N/A	N/A	N/A	N/A
		Storm Flow	1.30	0.39	1.3	0.44	1.3	0.38
	Road	Base Flow	1.0	0.34	0.78	0.45	0.78	0.39
		Storm Flow	2.43	0.39	2.43	0.44	2.43	0.38
	Ground	Base Flow	1.0	0.34	0.78	0.45	0.78	0.39
		Storm Flow	2.18	0.39	1.92	0.44	2.16	0.38
Total Phosphorous	Roof	Base Flow	N/A	N/A	N/A	N/A	N/A	N/A
		Storm Flow	-0.89	0.31	-0.89	0.36	-0.89	0.34
	Road	Base Flow	-0.97	0.31	-1.11	0.48	-0.6	0.50
		Storm Flow	-0.30	0.31	-0.30	0.36	-0.3	0.34
	Ground	Base Flow	-0.97	0.31	-1.11	0.48	-0.6	0.50
		Storm Flow	-0.47	0.31	-0.59	0.36	-0.39	0.34
Total Nitrogen	Roof	Base Flow	N/A	N/A	N/A	N/A	N/A	N/A
		Storm Flow	0.26	0.23	0.25	0.32	0.37	0.34
	Road	Base Flow	0.20	0.20	0.14	0.20	0.32	0.30
		Storm Flow	0.26	0.23	0.25	0.32	0.37	0.34
	Ground	Base Flow	0.20	0.20	0.14	0.20	0.32	0.30
		Storm Flow	0.26	0.23	0.25	0.32	0.37	0.34

Note: Parameters are shown as Log₁₀ of Concentration in mg/L

Source: Water by Design “MUSIC Modelling Guidelines”, Version 1.0 2010

5.3.5 SELECTION OF STORMWATER TREATMENT TRAIN

It is proposed to capture site generated runoff and treat flows prior to discharging off-site. Details for the proposed stormwater quality treatment train are included in **Table 5.6** below. Concept Civil Engineering Servicing Layout Plans has been prepared and are enclosed in **Appendix B** to illustrate the preliminary treatment device details and locations. The device details and plans are preliminary only and will be subject to confirmation during detailed design.

Table 5.6 Treatment Train Details

TREATMENT DEVICE	DETAILS
Pre-treatment OceanGuard Filters	2 x OceanGuard filters to be installed in all grated inlets
Main Treatment 690 StormFilters	4 x 690 PSorb StormFilters located in the detention tank

5.3.6 STORMWATER QUALITY MODELLING RESULTS

The predicted MUSIC pollutant concentrations are provided in **Table 5.7**.

Table 5.7 MUSIC Model Results

POLLUTANT TYPES	INITIAL POLLUTANT CONCENTRATION	RESIDUAL POLLUTANT CONCENTRATION	WATER QUALITY OBJECTIVES	REDUCTION ACHIEVED
Total Suspended Solids (TSS)	268 kg/yr	33 kg/yr	80%	87.8%
Total Phosphorous (TP)	0.63 kg/yr	0.22 kg/yr	60%	65.2%
Total Nitrogen (TN)	4.34 kg/yr	2.30 kg/yr	45%	47.0%
Gross Pollutants (GP)	47 kg/yr	0 kg/yr	90%	100%

(Refer to **Appendix D** for MUSIC Model Output Results).

As shown above, MUSIC predicts that the proposed treatment train will meet the Queensland DILGP State Planning Policy (2017) water quality objectives for key pollutants including TSS, TP, TN and GP. A copy of the model output is attached in **Appendix D**.

5.4 MAINTENANCE

The primary purpose of the stormwater treatment train is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the system to its full efficiency and effectiveness. Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance must be performed in accordance with Ocean Protect's Operations & Maintenance Manual enclosed in **Appendix E** to ensure the ongoing effectiveness of the proposed treatment devices.

Should an alternative equivalent mechanical treatment system be proposed during construction then the body corporate should be provided with manufacturer's guidelines on the ongoing maintenance of the alternative system, including:

- Regular collection of any litter build up in trash racks;
- Routine inspection of mechanical treatment devices to identify areas of obvious increase in sediment deposition or general damage to the systems;
- Replacement of cartridges will be required if the available treatment capacity is reduced by 25% (primarily due to accumulation of sediment) or if the system fails to drain adequately following tilling of the surface; and
- Removal of sediment or blockages that impede the conveyance of stormwater flows.

6. SEWERAGE AND WATER RETICULATION

Redland City Council as constructed information indicates that there is existing sewer and water infrastructure in the immediate vicinity of the site, along the Outridge Street and Meissner Street frontages. It is proposed to remove all redundant sewer and water property connections and to provide a new 150Ø sewer property connection and a new water service and meter to service the development. The sizing and location of the connections are to be further assessed by a hydraulic engineer however it is anticipated that the water meter will be constructed within the basement carpark.

A Water & Wastewater Planning Review for the Weinam Creek Priority Development Area prepared by Calibre, issued on the 7th April 2020, provides review commentary on the proposed water and wastewater network planning completed by Redland City Council (RCC) in support of the Weinam Creek Priority Development Area (PDA). In the report, it is acknowledged that there are insufficiencies in the capacity of both the water and sewer reticulation infrastructure in the Weinam Creek PDA. As such, it is anticipated that the approximate \$4.98 million dollar upgrade works will be completed by Redland City Council to ensure that the proposed development and future development of the Weinam Creek PDA can be supported.

We understand that EDQ and Redland City Council are currently in discussions concerning the delivery of these new upgrades and assets and that these works would be considered as trunk infrastructure for the servicing of the priority development area of Redland Bay.

Concept civil servicing layout plans have been prepared and enclosed in **Appendix B** of this report to illustrate anticipated servicing arrangements for the proposed development. It should be noted that these plans are preliminary only and will be subject to confirmation during detailed design.

7. Electricity & Telecommunication Services

Dial Before You Dig (DBYD) information obtained for the subject site indicates that electricity, telecommunication and gas services are available at or near the subject site. It is anticipated that connections will be available to these services for the development without substantial external works. Specialist advice will be obtained for these services to confirm adequate capacity or to identify any external works that may be required.

8. CONCLUSION

Lambert & Rehbein (SEQ) Pty Ltd has been commissioned by New Fortune Investments to prepare a Civil Engineering Services Report for a proposed multi-unit residential development at 8 Outridge Street and 69 & 71 Banana Street, Redland Bay.

The project includes the amalgamation of the existing residential lots and construction of a multi-storey residential apartment building with a childcare centre at ground level and underground parking. The proposed lot layout plan prepared by Hayes Anderson Lynch Architects is enclosed in **Appendix A** of this report.

Concept Civil Engineering Servicing Layout Plans have been prepared and are enclosed in **Appendix B** to illustrate the proposed servicing arrangements for the development.

Based on preliminary investigations, existing civil engineering services are either provided or can be extended / altered to service the proposed development. Furthermore, no engineering constraints have been identified as part of this assessment that, in our opinion, should preclude approval of the proposed development by Economic Development Queensland.

APPENDIX A – DEVELOPMENT LAYOUT PLANS BY HAYES ANDERSON LYNCH ARCHITECTS

TOWN PLANNING DRAWINGS

Apartment & Childcare Development

18 Outridge Street, 69 & 71 Banana Street, QLD, 4165

KEY PROPOSAL STATISTICS - MULTIPLE DWELLING		
Site Area	2,427.85	
Frontage:	55.1m+37.6m+4.9m+62.9m	
Number of Storeys:	8	
Maximum Building Height :	28.2m Above N.G.L (to lift overrun)	
Total No. of Dwellings	52	

CARPARK SUMMARY		
Car Spaces - Resident	100	
Car Spaces - Child Care	36	
Car Spaces - Visitor	6	
		142
Car Spaces - Accessible -		
		1

CHILDCARE SUMMARY		
Nursery :	8 Children	
Toddler Kids:	8 Children	
Junior Kindy:	20 Children	
Senior Kindy:	40 Children	
Kindergarten:	44 Children	
Total:	120	
Outdoor area req:		840
Outdoor area prov:		844



General Notes

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Where ambiguities or discrepancies exist, the Engineer shall contact the Architect for clarification.

Further Issues	Response	EA	RH
14/04/23	G	Further Issues	Response
14/03/23	F	Further Issues	Response
16/02/23	E	TP Lodgement	Issue
11/02/23	D	TP Lodgement	Issue
21/10/22	C	TP Lodgement	Issue
18/10/22	B	TP Lodgement	Issue
04/10/22	A	TP Lodgement	Issue



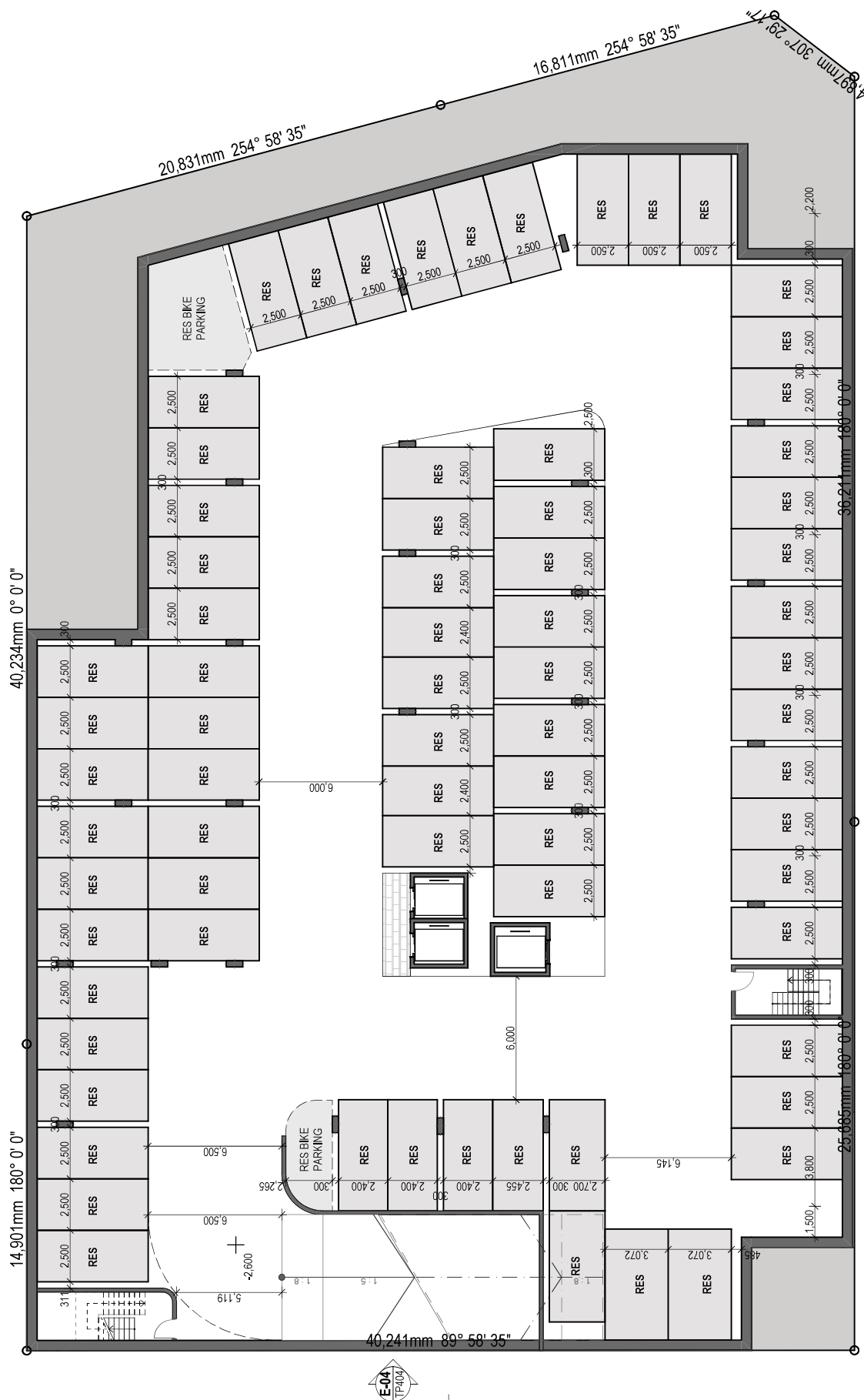
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Project
Apartment & Childcare
Development
18 Outridge Street, 69 & 71 Banana Street,
Redland Bay QLD 4165

Drawing Title

Scale @ A3	Drawn:	Checked:
1:200	RH, JS	EA
Project Number	Drawing Number	Issue
H4514BAN	TP201	G



TOWN PLANNING

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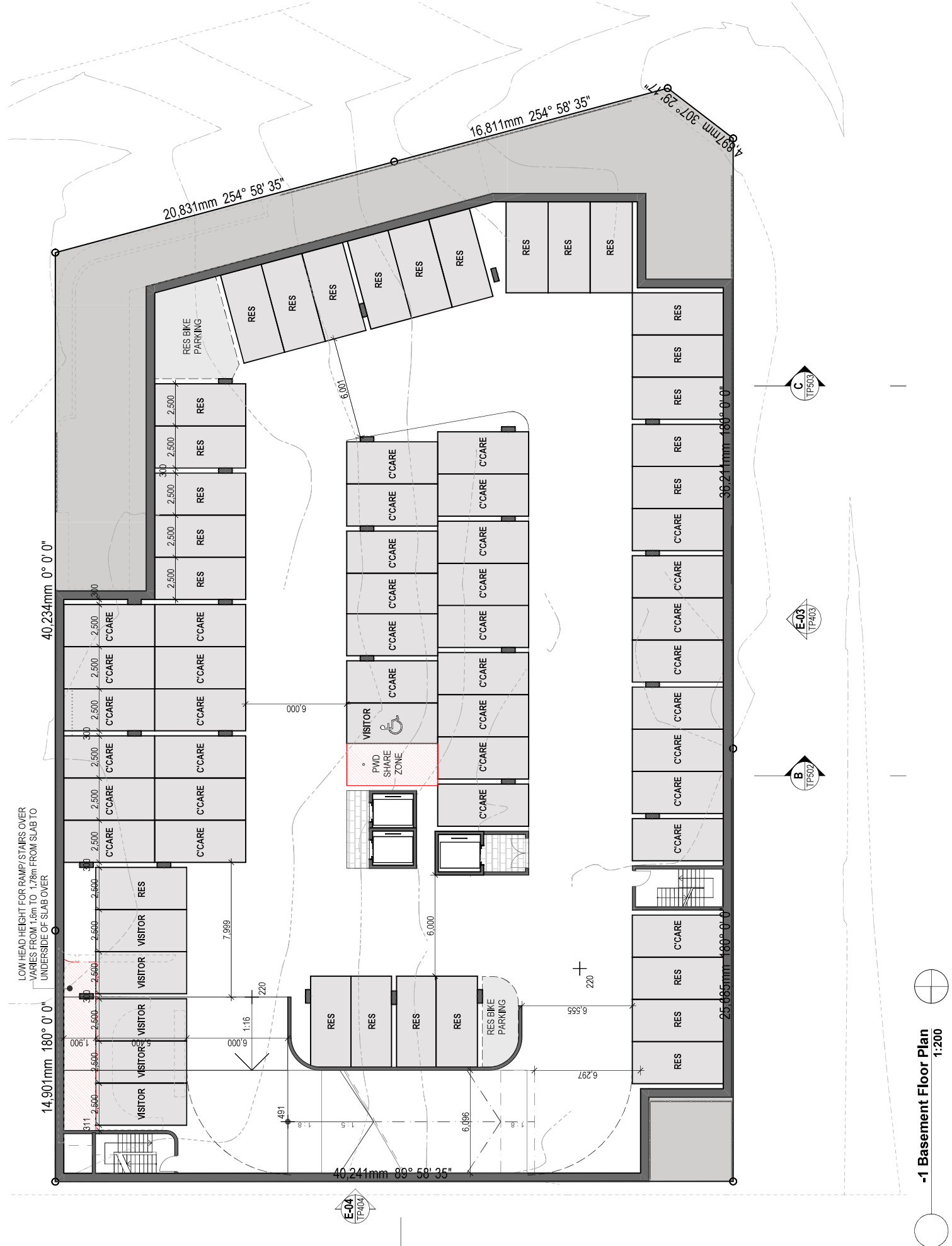
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14/04/23	G	Further Issues Response	RH
14/03/23	F	Further Issues Response	EA
01/02/23	D	TP Lodgement Issue	EA
21/10/22	C	TP Lodgement Issue	EA
18/10/22	B	TP Lodgement Issue	EA
04/10/22	A	TP Lodgement Issue	EA

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Project: **Apartment & Childcare**
Development: **Apartment & Childcare**
1800-00-0000, 68 & 71 Banana Street,
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Drawing Title			
Basement -1 Floor Plan			
Scale @ A3	Drawn:	Checked:	
1:200	RH, JS	EA	
Project Number	Drawing Number	Issue	
H4514BAN	TP202	G	



-1 Basement Floor Plan
1:200

14/04/23	G	Further Issues	Response	RH
14/03/23	F	Further Issues	Response	EA
16/02/23	E	TP Lodgement	Issue	EA
01/10/23	D	TP Lodgement	Issue	EA
21/10/22	C	TP Lodgement	Issue	EA
18/10/22	B	TP Lodgement	Issue	EA
04/10/22	A	TP Lodgement	Issue	EA



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Project
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Drawing Title
Ground Floor Plan
 Scale @ A3
 1:200
 Drawn:
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 Checked:
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 Project Number
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 Drawing Number
 TP203
 Issue
 G



Ground Floor Plan
1:200

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Date	Issue	Details	Checked
14/04/23	G	Further Issues Response	RH
14/03/23	F	Further Issues Response	EA
01/02/23	D	TP Lodgement Issue	EA
01/02/23	D	TP Lodgement Issue	EA
21/10/22	C	TP Lodgement Issue	EA
18/10/22	B	TP Lodgement Issue	EA
04/10/22	A	TP Lodgement Issue	EA

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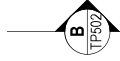
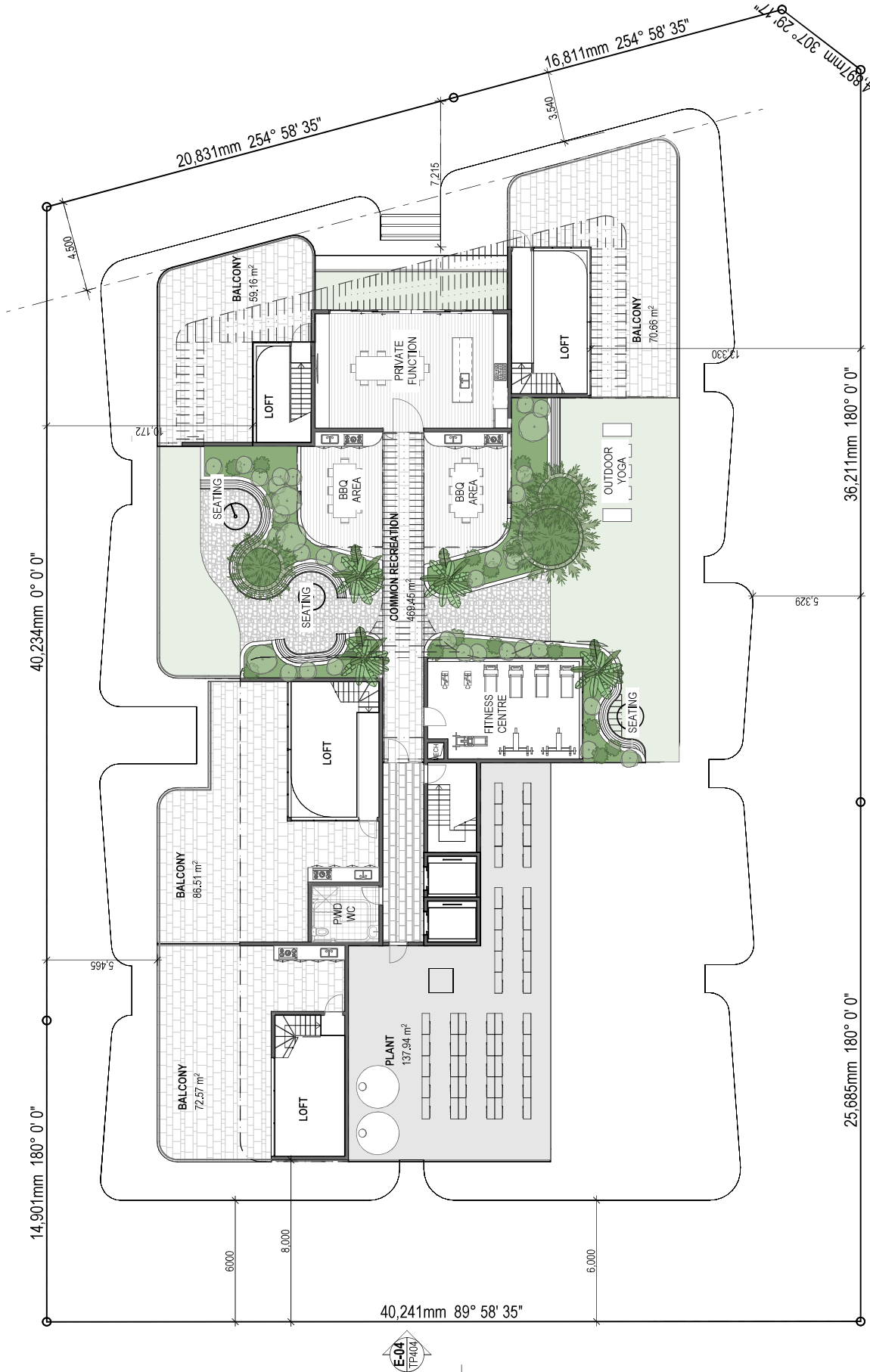


Project: **Apartment & Childcare**

Development: **18° 05' 11" S, 151° 08' 7" E**
Redland Bay, QLD 4165

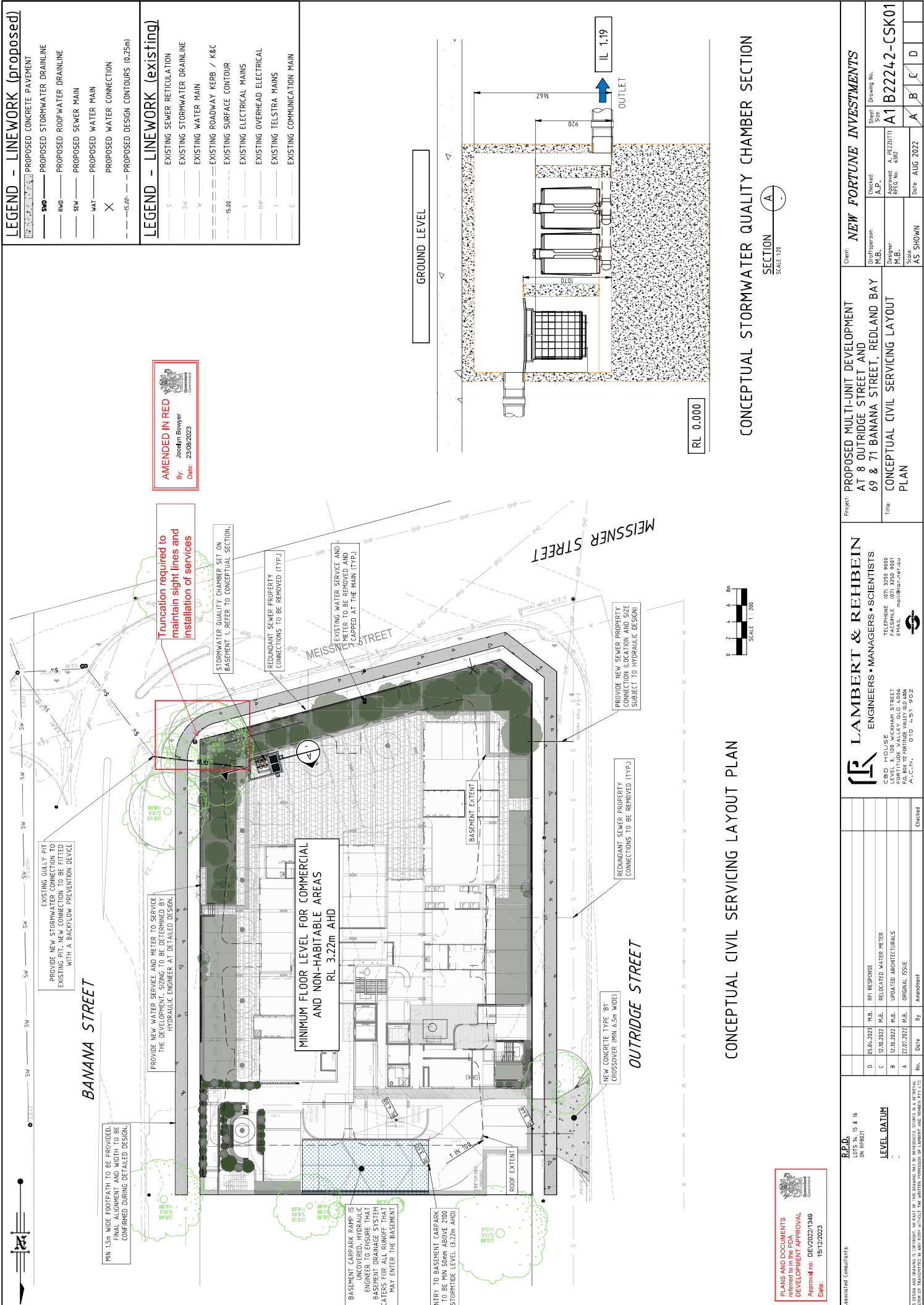
Drawing Title: **Roof Plan**

Scale @ A3	Drawn:	Checked:
1:200	RH, JS	EA
Project Number	Drawing Number	Issue
H4514BAN	TP207	G



Roof Plan
1:200

APPENDIX B – CONCEPTUAL CIVIL ENGINEERING PLAN

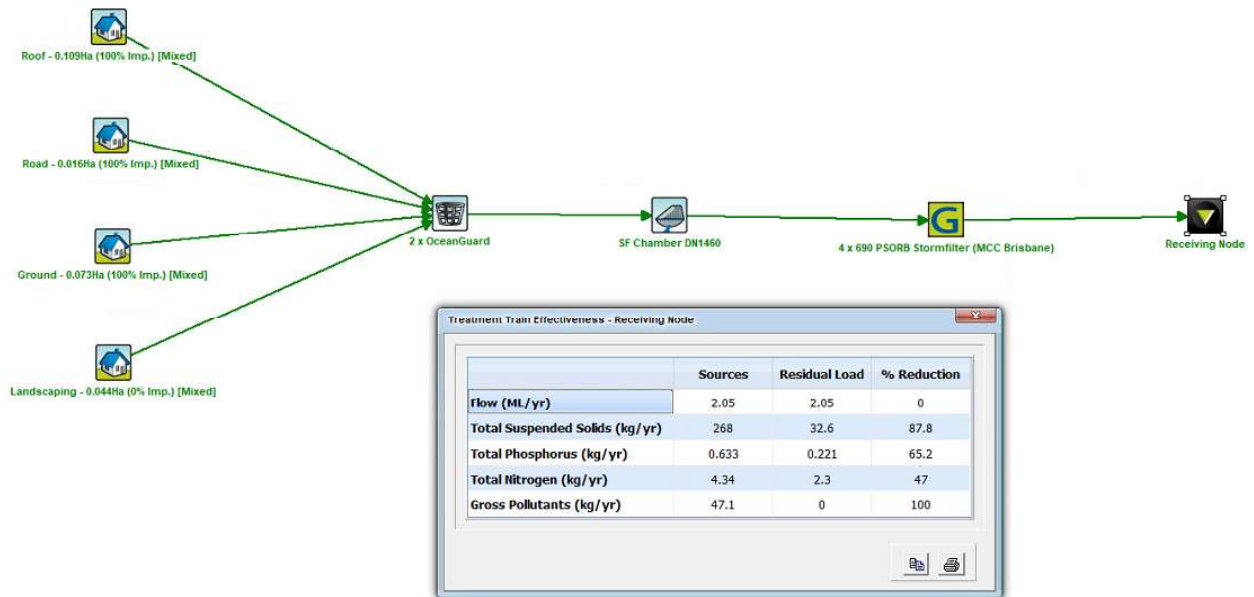


PLANS AND DOCUMENTS referred to in the PDA
DEVELOPMENT APPROVAL
Approval no: DEV2022/1349
Date: 15/12/2023

Approved Consultant:		R.D. LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS		Client: NEW FORTUNE INVESTMENTS	
R.D. LAMBERT & REHBEIN ENGINEERS • MANAGERS • SCIENTISTS		Project: PROPOSED MULTI-UNIT DEVELOPMENT AT 8 OUTRIDGE STREET AND 69 & 71 BANANA STREET, REDLAND BAY		Checked: M.B. A.P.	
LEVEL DATUM		Title: CONCEPTUAL CIVIL SERVICING LAYOUT PLAN		Sheet Size: A1 B22242-CSK01	
No.	Date	By	Approval	Designer: M.B. A.P.	
1	22.07.2023	M.B.	ORIGINAL ISSUE	Approved: M.B. A.P.	
2	12.10.2022	M.B.	UPDATED ARCHITECTURALS	RPA No: 682	
3	05.04.2023	M.B.	RFI RESPONSE	Date: AUG 2022	
4	12.10.2022	M.B.	RELICATED WATER METER	Scale: AS SHOWN	
5	12.10.2022	M.B.	UPDATED ARCHITECTURALS	A B C D	
6	12.10.2022	M.B.	UPDATED ARCHITECTURALS	A B C D	
7	12.10.2022	M.B.	UPDATED ARCHITECTURALS	A B C D	
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APPENDIX C – MUSIC MODELLING RESULTS



APPENDIX D – OCEAN PROTECT INSTALLATION AND MAINTENANCE MANUALS

StormFilter[®]

Operations & Maintenance Manual

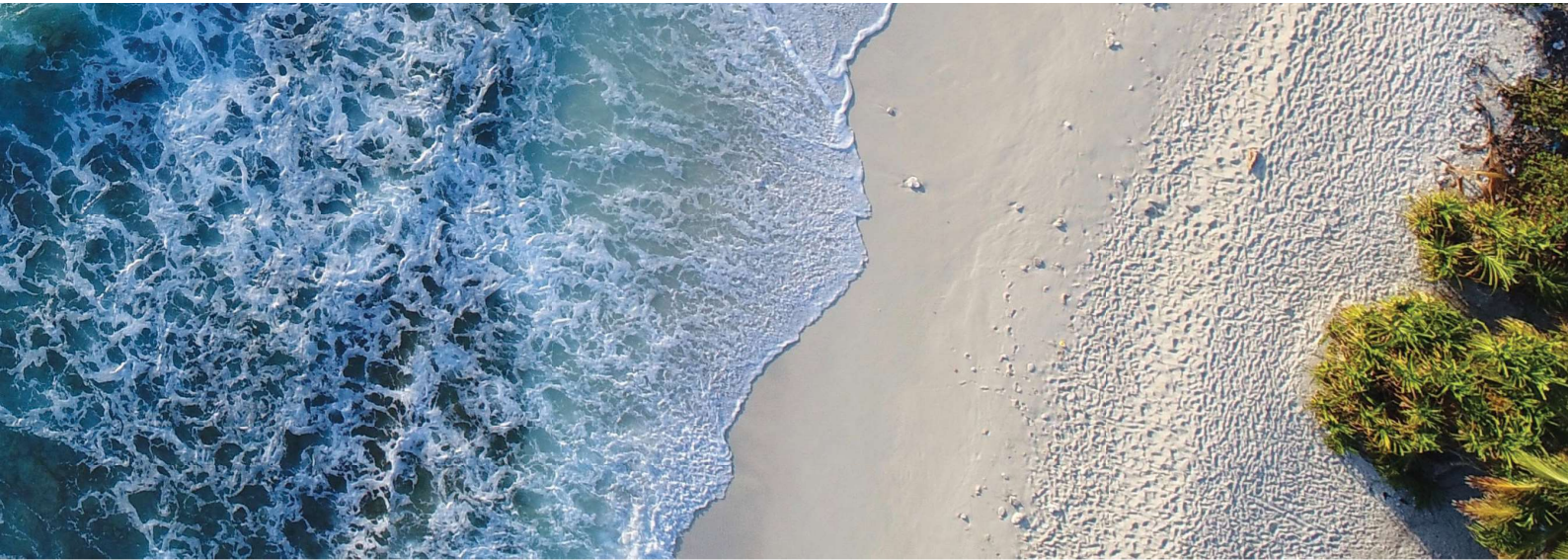


Stopping Pollution Entering Waterways



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Introduction	3
Health and Safety	4
How does it work?	5
Maintenance Procedures	6
Maintenance Services	8



Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the StormFilter®, as recommended by the manufacturer (Ocean Protect).

The StormFilter® is designed and sized to meet stringent regulatory requirements. It removes the most challenging target pollutants (including fine solids, soluble heavy metals, oil, and soluble nutrients) using a variety of media. For more than two decades, StormFilter® has helped clients meet their regulatory needs and, through ongoing product enhancements, the design continues to be refined for ease of use and improved performance.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the StormFilter®.

Health and Safety

Access to a StormFilter® unit requires removing heavy access covers/grates, and it is necessary to enter a confined space. Pollutants collected by the StormFilter® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your StormFilter® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the StormFilter®, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of StormFilter® maintenance can be performed from surface level, there will be a need to enter the StormFilter® system (confined space) during a major service. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it work?

Stormwater enters the cartridge chamber, passes through the filtration media and begins filling the cartridge center tube. When water reaches the top of the cartridge the float valve opens and filtered water is allowed to drain at the designed flow rate. Simultaneously, a one-way check valve closes activating a siphon that draws stormwater evenly throughout the filter media and into the center tube. Treated stormwater is then able to discharge out of the system through the underdrain manifold pipework.

As the rain event subsides, the water level outside the cartridge drops and approaches the bottom of the hood, air rushes through the scrubbing regulators releasing the water column and breaking the siphon. The turbulent bubbling action agitates the surface of the cartridge promoting trapped sediment to drop to the chamber floor. After a rain event, the chamber is able to drain dry by way of an imperfect seal at the base of the float valve.

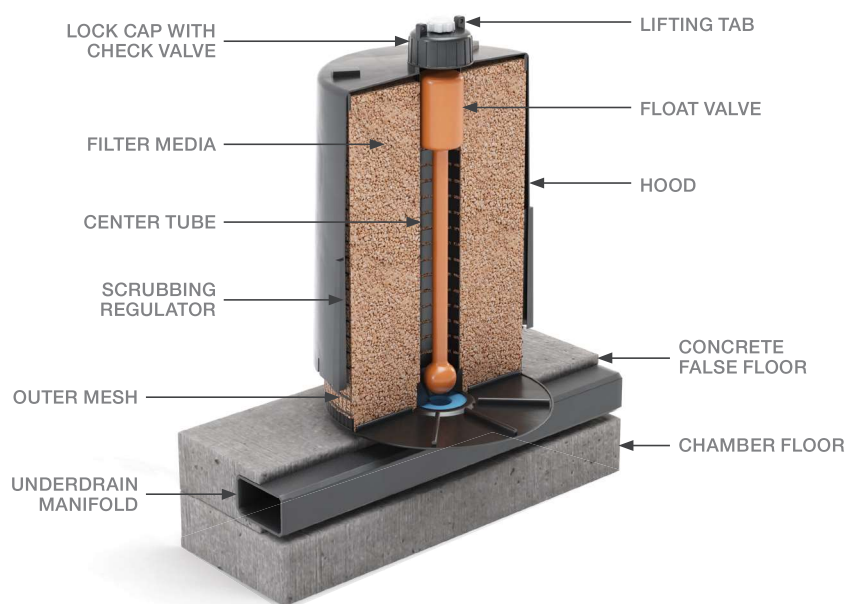


Figure 1: StormFilter® components

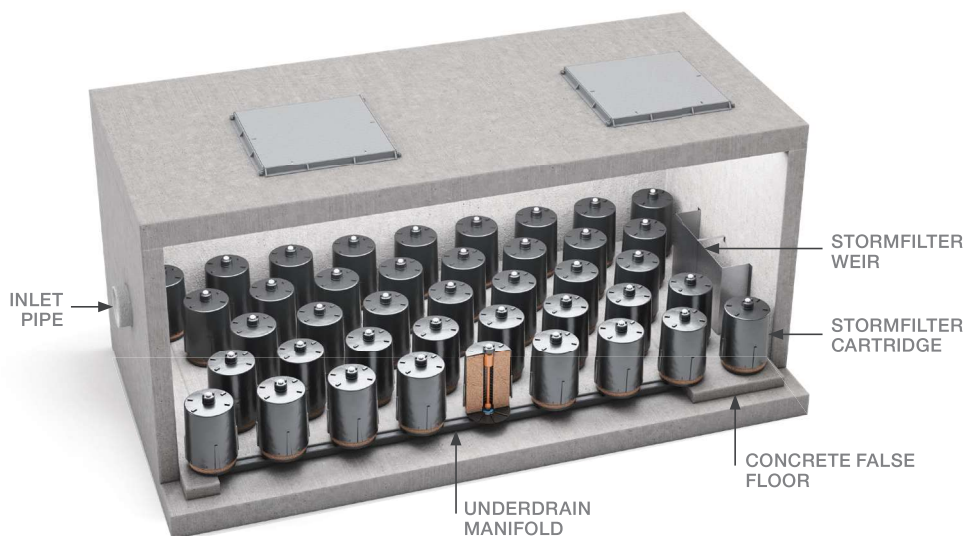


Figure 2: Example conceptual diagram of a StormFilter® system

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter® requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter® cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter®.

Service Type	Description of Typical Activities	Frequency
Inspection	Visual Inspection of cartridges & chamber Remove larger gross pollutants Perform minimal rectification works (if required)	Every 6 Months
Minor Service	Evaluation of cartridges and media Removal of accumulated sediment (if required) Wash-down of StormFilter® chamber (if required)	Every 12 Months
Major Service	Replacement of StormFilter® cartridge media	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Inspection

The purpose of the inspecting the StormFilter® system is to assess the condition of the StormFilter® chamber and cartridges. When inspecting the chamber, particular attention should be taken to ensure all cartridges are firmly connected to the connectors. It is also an optimal opportunity to remove larger gross pollutants and inspect the outlet side of the StormFilter® weir.

Minor Service

This service is designed to ensure the ongoing operational effectiveness of the StormFilter® system, whilst assessing the condition of the cartridge media.

- 1 Establish a safe working area around the access point(s)
- 2 Remove access cover(s)
- 3 Evaluate StormFilter® cartridge media (if exhausted schedule major service within 6 months)
- 4 Measure and record the level of accumulated sediment in the chamber (if sediment depth is less than 100 mm skip to step 9)
- 5 Remove StormFilter® cartridges from the chamber
- 6 Use vacuum unit to removed accumulated sediment and pollutants in the chamber
- 7 Use high pressure water to clean StormFilter® chamber
- 8 Re-install StormFilter® cartridges
- 9 Replace access cover(s)

Major Service (Filter Cartridge Replacement)

For the StormFilter® system a major service is reactionary process based on the outcomes from the minor service, specifically the evaluation of the cartridge media.

Trigger Event	Maintenance Action
Cartridge media is exhausted ^[1]	Replace StormFilter® cartridge media ^[2]

^[1] Multiple assessment methods are available, contact Ocean Protect for assistance

^[2] Replacement filter media and components are available for purchase from Ocean Protect

This service is designed to return the StormFilter® device back to optimal operating performance.

- 1 Establish a safe working area around the access point(s)
- 2 Remove access cover(s)
- 3 By first removing the head cap, remove each individual cartridge hood to allow access to the exhausted media
- 4 Utilise a vacuum unit to remove exhausted media from each cartridge
- 5 Use vacuum unit to remove accumulated sediment and pollutants in the chamber
- 6 Use high pressure water to clean StormFilter® chamber
- 7 Inspect each empty StormFilter® cartridges for any damage, rectify damage as required
- 8 Re-fill each cartridge with media in line with project specifications
- 9 Re-install replenished StormFilter® cartridges
- 10 Replace access cover(s)

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the StormFilter® unit should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess them for contamination – and, depending on the type of spill event, it may be necessary to replace the filtration media.

Blockages

In the unlikely event that flooding occurs upstream of the StormFilter® system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

- 1 Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
- 2 Inspect the StormFilter® unit checking the underdrain manifold as well as both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the StormFilter® after a major storm event. The focus is to inspect for damage and abnormally high sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants should be removed and disposed

Disposal of Waste Materials

The accumulated pollutants found in the StormFilter® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter media has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience, Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of StormFilter®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement media for cartridges.

**For more information please visit
www.oceanprotect.com.au**

The background of the lower half of the page features a series of concentric, overlapping circles in various shades of blue and teal, creating a wave-like or ripple effect that originates from the right side and moves towards the left.

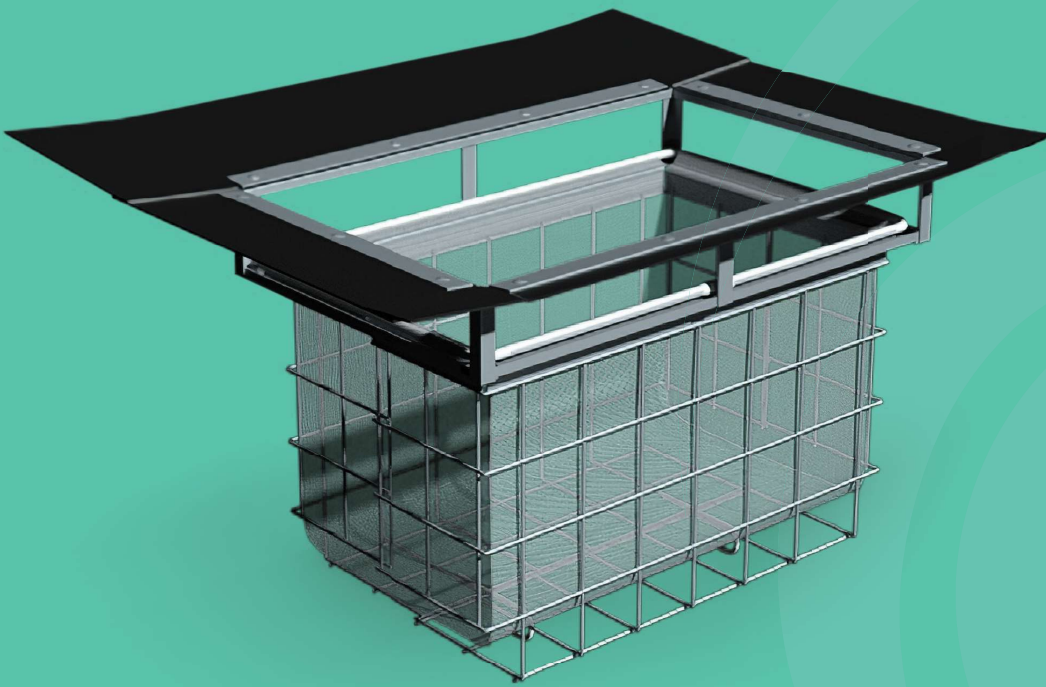
Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722



OceanGuard®

Operations & Maintenance Manual

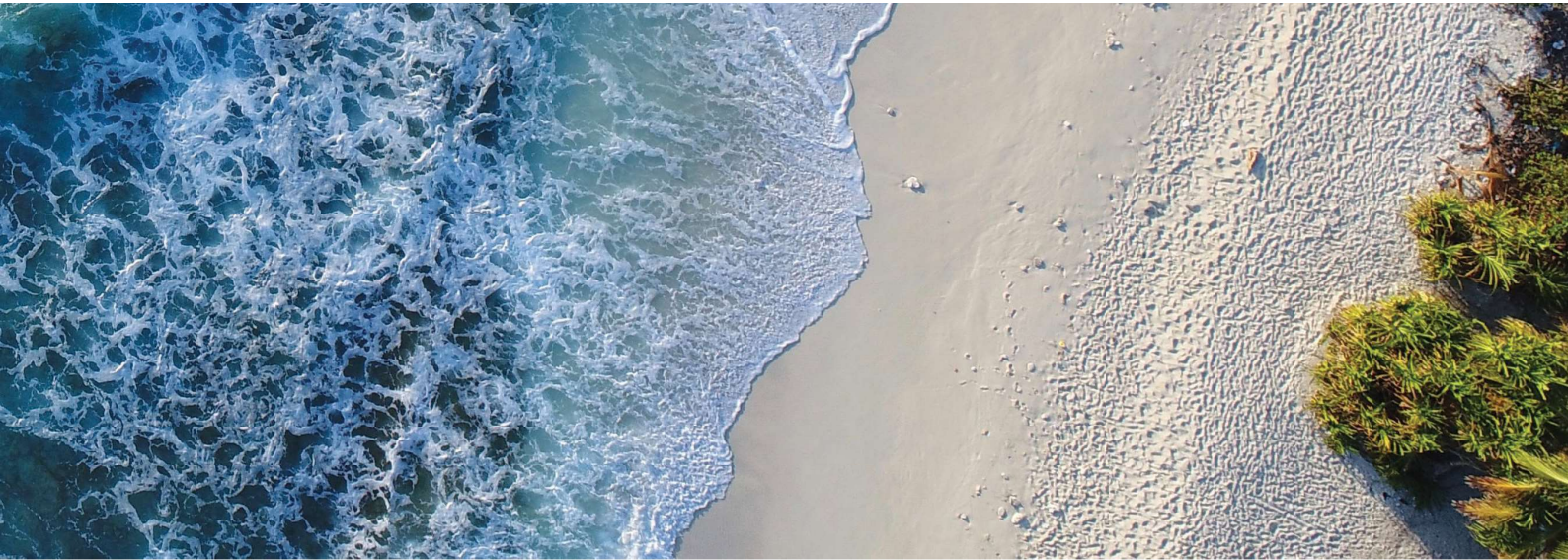


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Introduction	3
Health and Safety	4
How does it work?	5
Maintenance Procedures	6
Maintenance Services	7



Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the OceanGuard® as recommended by the manufacturer (Ocean Protect).

The OceanGuard® technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of filtration liners, designed to remove gross pollutants, solids, and other attached pollutants as either a standalone technology or as part of a 'treatment train' (e.g. with StormFilter®, Jellyfish® or biofiltration). OceanGuards are highly effective, easy to install and simple to maintain.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most importantly ensures the long term effective operation of the OceanGuard®.

Health and Safety

Access to pits containing an OceanGuard® typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the OceanGuard®, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

The OceanGuard® is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry.

How does it work?

OceanGuard® is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard® has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).

During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard® ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard® filtration bag. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

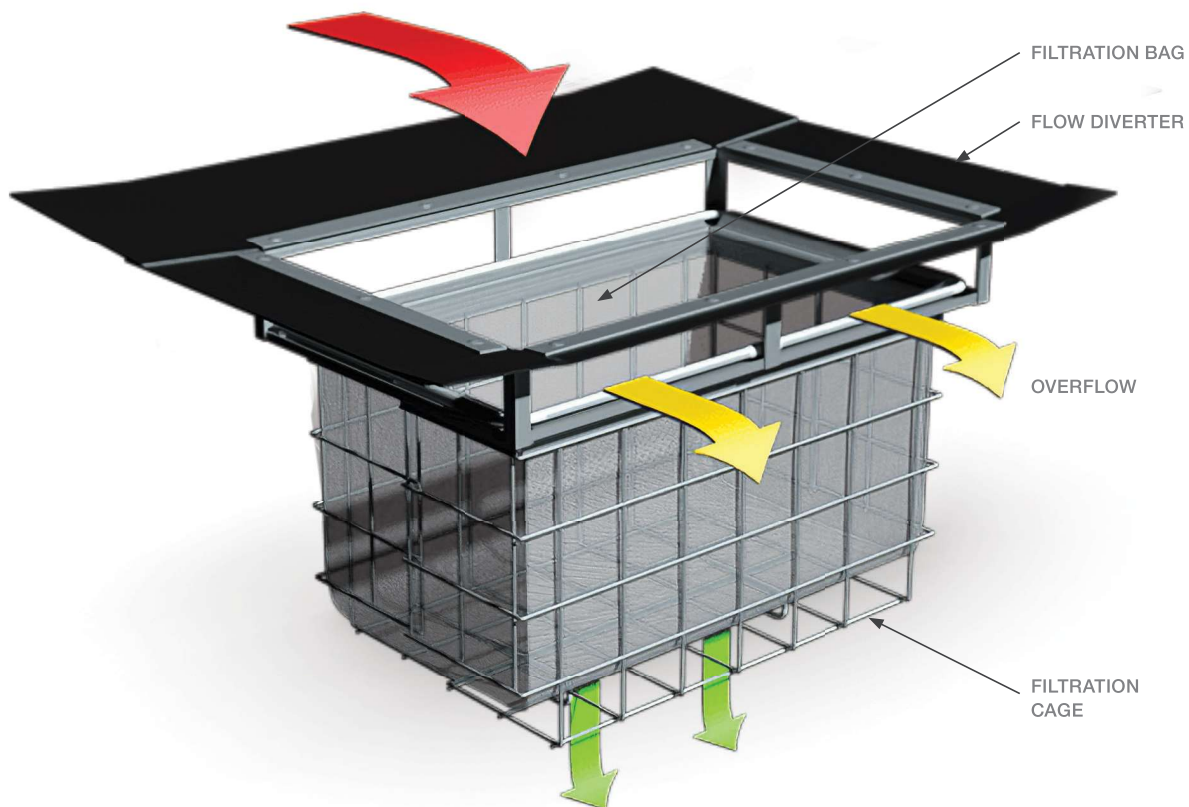


Figure 1: OceanGuard® components

Maintenance Procedures

To ensure that each OceanGuard® achieves optimal performance, it is advisable that regular maintenance is performed. The OceanGuard® requires 1-6 minor services annually (3 to 4 typical), pending the outcome of these inspections additional maintenance servicing may be required.

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the OceanGuard®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	1-6 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to return the OceanGuard® back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

- 1 Establish a safe working area around the OceanGuard®
- 2 Remove access cover/grate
- 3 Use two lifting hooks to remove the filtration bag
- 4 Empty the contents of the filtration bag into a disposal container
- 5 Inspect and evaluate the filtration bag
- 6 Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
- 7 Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
- 8 Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

- 1 Establish a safe working area around the OceanGuard®
- 2 Remove access cover/grate
- 3 Vacuum captured pollutants from the filtration bag
- 4 Remove filtration bag
- 5 Inspect and evaluate the filtration bag
- 6 Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
- 7 Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
- 8 Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard®, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag ^[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components ^[1]

^[1] Replacement filtration bags and components are available for purchase from Ocean Protect

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, all OceanGuard® pits that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuard's internal high flow bypass functionality is designed to minimise the potential of blockages/flooding and this configuration has been field proven for over twenty years. Flooding caused by an OceanGuard® style of pit basket is extremely rare and in the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

- 1 Inspect the OceanGuard® flow diverter, ensuring that they are free of debris and pollutants
- 2 Perform a minor service on the OceanGuard®
- 3 Remove the OceanGuard® to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard® after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

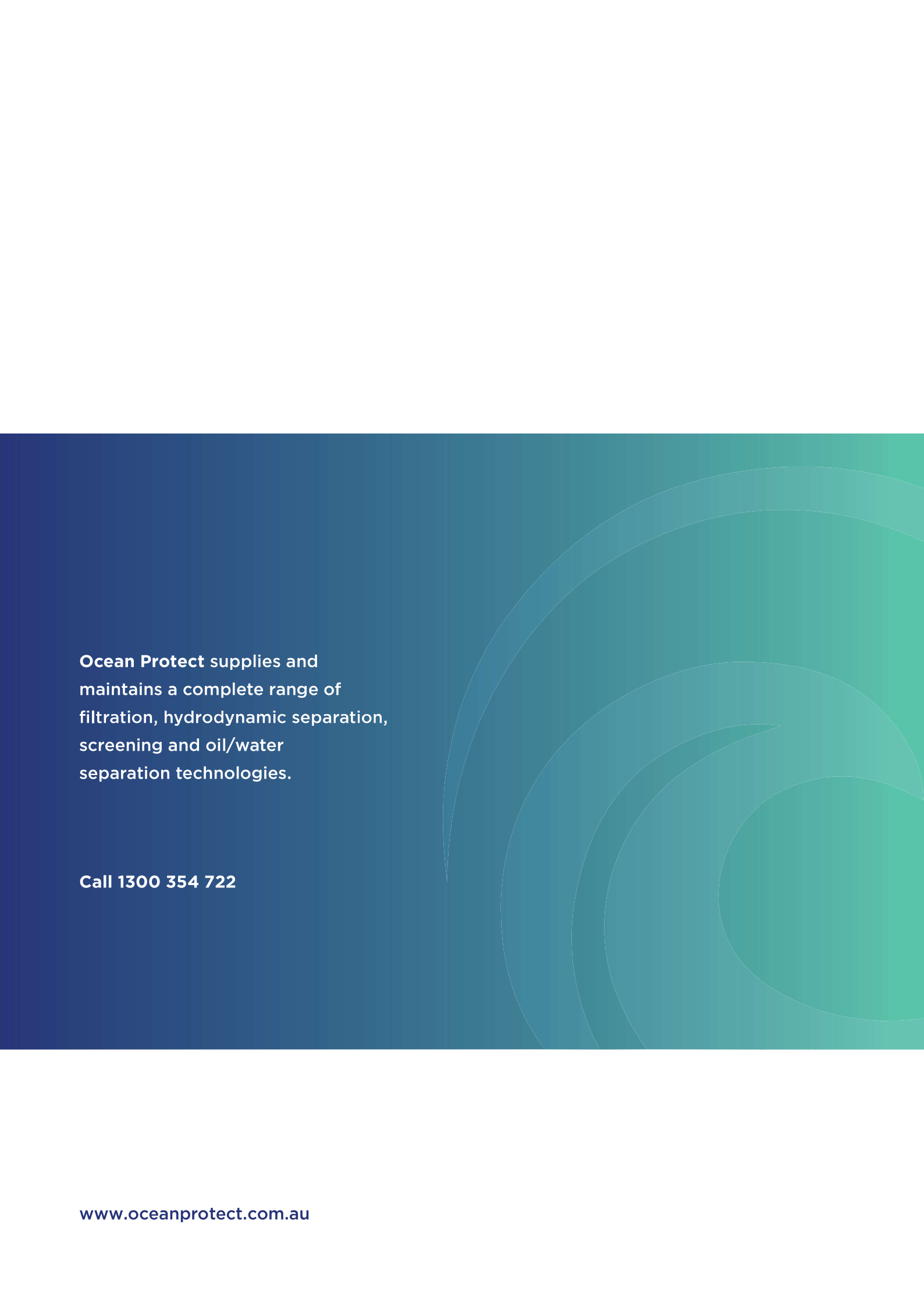
The accumulated pollutants found in the OceanGuard® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanGuard®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

For more information please visit
www.oceanprotect.com.au



Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.oceanprotect.com.au