

# Infrastructure Report

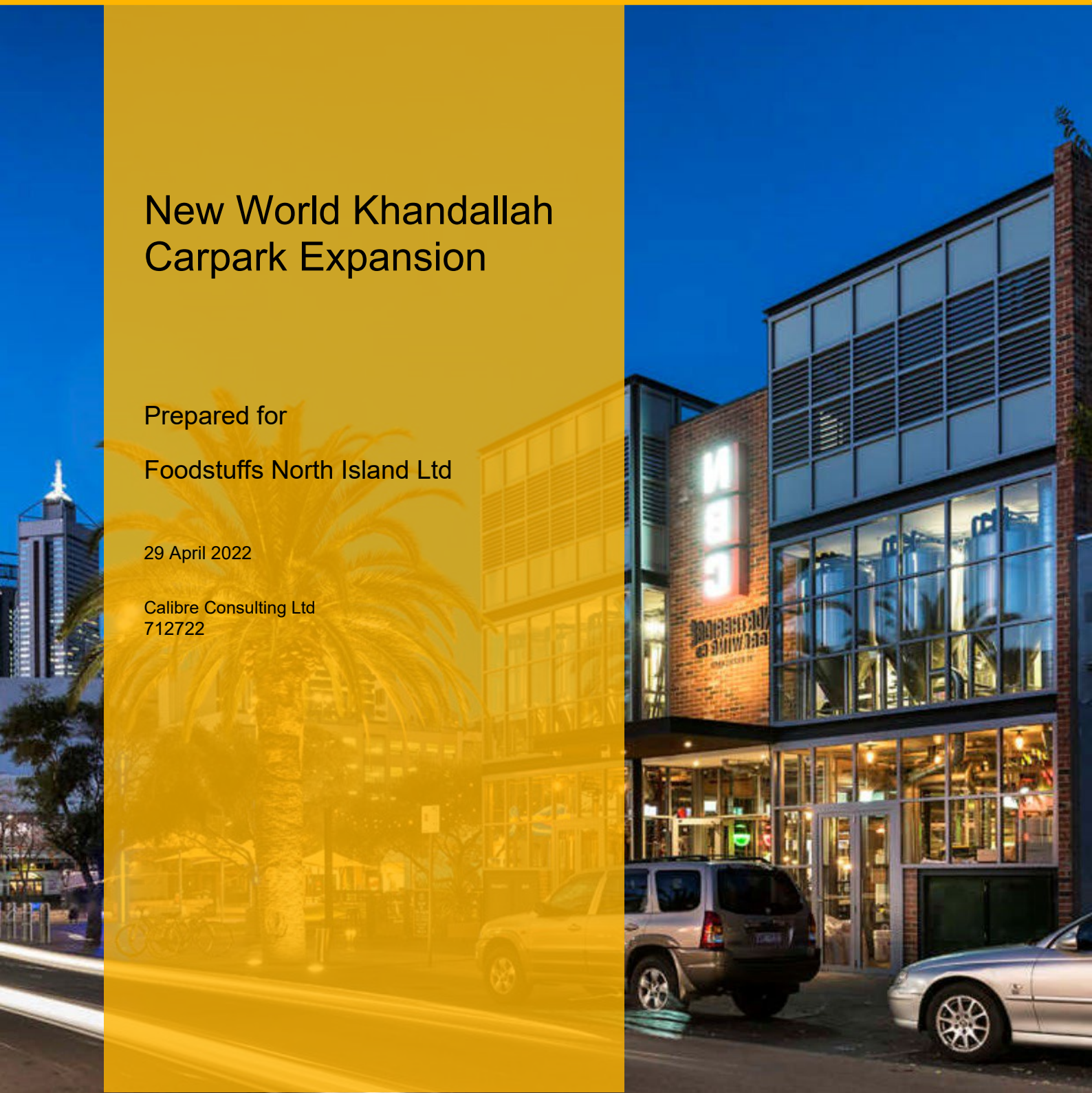
## New World Khandallah Carpark Expansion

Prepared for

Foodstuffs North Island Ltd

29 April 2022

Calibre Consulting Ltd  
712722



## QUALITY ASSURANCE STATEMENT

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Approved for Issue by	Rob Truter	

## DOCUMENT CONTROL

ISSUE	DATE	ISSUE DETAILS	AUTHOR	CHECKED	APPROVED
00	21/04/2022	For Resource Consent	DBS	SW	RT
01	29/04/2022	Retaining wall appendix added	TA	KS	TA

712722 Re 20220429 Nw Khandallah Car Park Foodstuffs

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# 1. Introduction

This report is prepared to support the concept design for the development of the Khandallah New World carpark extension. The report covers the earthworks, roading and stormwater associated with the project.

# 2. Existing Site

The site has been used historically for residential purposes and typically falls to the southwest. The site features retaining walls and trees/vegetation associated with residential areas, these will be either removed or maintained during the construction phase of the project.

The site has the typical 3 waters and utility connections associated with residential dwellings. These will need to be capped at the mains connection point or at the property boundary and the sections of pipe removed or abandoned.

# 3. Earthworks and Sediment Control

## 3.1 Earthworks

The earthworks associated with the project involve cutting and filling of the site over 2,800m<sup>2</sup> to achieve the proposed carpark levels. Construction of retaining walls is required to support the cut and fill batters.

Table 1: Earthworks Volume Table

Total Cut (m <sup>3</sup> )	Total Fill (m <sup>3</sup> )	Balance (m <sup>3</sup> )
2540	90	2450

The retaining walls vary in height up to 3.4m high, predominantly supporting the pedestrian right of way (1m wide) which is significantly higher than the finished floor level of the adjoining New World shopping centre. Appropriate pedestrian barriers/fence will be installed along this section. Vehicle barriers are required where there is a retained height equal or higher than 0.6m for protection from falling.

Refer to Appendix A for the engineering drawings.

## 3.2 Erosion and Sediment Control

The erosion and sediment control (ESCP) measures incorporate silt fences and earth bund and channels to collect the dirty water runoff from inside the site and divert it to two earth bund decants for discharge from site. A clean water diversion channel diverts water from entering the site.

Stabilised site access are to be constructed at the existing entrances. Soil Loss calculation is in Appendix B

Refer to Appendix A for the engineering drawings.

# 4. Roading

The road environments have all been specifically designed to suit the vehicle movement, parking, pedestrian, utilities, and access requirements of their circumstances. That includes the choice of kerb types (standard kerb and channel and edge kerb).

Construction of accessway 1 from Nicholson Road will require the existing wastewater manhole lid to be raised to match the new entrance levels. The existing vehicle crossing on Nicholson Road is to be upgraded and the kerb reinstated.

Construction of accessway 2 from the existing carpark to the proposed carpark will require the existing manholes etc. to be taken into consideration in the design.

Acoustic walls, designed by others, will be installed in the location shown on drawing C300.

Refer to Appendix A for the engineering drawings.

## 5. Stormwater

The existing private pipe network and kerb discharge points along Dekka Street will be removed and the kerb is to be reinstated.

The carpark is design to create the crest near the intersection of Accessway 1 and 2, which separately drains the surface stormwater towards lowed placed sumps.

The northerly stormwater runoff from the proposed carpark is collected via sumps inside the carpark area and is treated (stormwater filter) prior to being discharged to kerb along Dekka Street.

The southerly stormwater runoff from the proposed carpark is collected via sumps inside the carpark area and is treated (stormwater filter) prior to being piped to a detention tank at the Nicholson Road carpark entrance. This is then discharged to Council public drainage system.

Stormwater from the retaining walls is to be collected by subsoil drain behind the retaining walls and connected to the proposed stormwater system via a silt trap sump.

Refer to Appendix A for the engineering drawings

The detention tank has been designed to mitigate stormwater run-off flows equal or less than pre-development levels for 10 year and 100-year storm events. The detention tank volume is designed as 3m<sup>3</sup> to meet the required mitigation scenario.

Refer to Appendix B for the stormwater calculations.

## 6. Conclusion

Based on the above, the proposed development will have less than minor effects on the existing infrastructure,

## Appendix A    Engineering Drawings

## Document List No. TR1

Project name: NEW WORLD KHANDALLAH CARPARK EXPANSION  
 Project Number: 712722  
 Client: FOODSTUFFS NORTH ISLAND LTD  
 Subject: FOR RESOURCE CONSENT  
 Comment: FOR RESOURCE CONSENT  
 Date: 23-Aug-23  
 Issued by: KD Authorised: SW

### Media and Status Details

Print Size	Digital	Media	Purpose	Phase
<input type="checkbox"/> A0 <input type="checkbox"/> B0	<input checked="" type="checkbox"/> PDF	<input type="checkbox"/> Print	<input type="checkbox"/> Preliminary	<input checked="" type="checkbox"/> Consent
<input type="checkbox"/> A1 <input type="checkbox"/> B1	<input type="checkbox"/> DWG	<input type="checkbox"/> Film/Tracing	<input type="checkbox"/> Information	<input type="checkbox"/> Feasibility
<input type="checkbox"/> A2 <input type="checkbox"/> B2	<input type="checkbox"/> DGN	<input type="checkbox"/> CD/Disk	<input type="checkbox"/> Comments	<input type="checkbox"/> Concept
<input checked="" type="checkbox"/> A3 <input type="checkbox"/> B3	<input type="checkbox"/> PDF+DWG	<input type="checkbox"/> By Hand	<input type="checkbox"/> As Requested	<input type="checkbox"/> Detail Design
<input type="checkbox"/> A4 <input type="checkbox"/> B4	<input type="checkbox"/> PDF+DGN	<input checked="" type="checkbox"/> Email	<input checked="" type="checkbox"/> For Approval	<input type="checkbox"/> For Construction
<input type="checkbox"/> Other <input type="checkbox"/> Other	<input type="checkbox"/> Other	<input type="checkbox"/> LAN/WAN	<input type="checkbox"/> Construction	<input type="checkbox"/> As Built

### Distribution Details

1  
1

### Document Details

Document Number	Rev	Document Title
712722-C000	0	COVER SHEET
712722-C100	0	EXISTING SITE PLAN
712722-C170	1	EROSION AND SEDIMENT CONTROL PLAN
712722-C171	0	EROSION AND SEDIMENT CONTROL DETAILS
712722-C200	2	PROPOSED CONTOUR PLAN
712722-C201	2	CUT AND FILL PLAN
712722-C205	1	SITE SECTIONS
712722-C210	1	RETAINING WALL PLAN
712722-C211	1	RETAINING WALL SECTIONS
712722-C300	2	ACCESSWAY PLAN
712722-C301	0	ACCESSWAY LONG SECTIONS
712722-C302	1	TYPICAL ROAD CROSS SECTIONS
712722-C303	1	ROADING CONSTRUCTION DETAILS
712722-C400	1	DRAINAGE PLAN
712722-C401	1	STORMWATER CATCHMENT PLAN
712722-C405	0	STORMWATER LONG SECTION
712722-C800	0	STANDARD DETAILS SHEET 1

# REFER TO UPDATED ENGINEERING DRAWINGS

<https://wellington.govt.nz/-/media/property-rates-and-building/resource-consents/files/applications/new-world-khandallah-car-park/updated-engineering-drawings.pdf?la=en&hash=7402460D0730EE378074BDADC16702F4F224F1C1>



## Appendix B      Calculations

**Stormwater Attenuation Design (10-Year)**  
Wellington Water 12-hour nested rainfall distribution

Project:	New World Khandallah Car Park expansion	Revision:	B
Job Number:	712722	By:	DBS
		Date:	12.04.22
		Checked:	SW
		Date:	

Pre-development Catchments			
Surface:	Catchment Areas:	Runoff Coefficients:	Effective Areas:
Landscape	A1= 1354m <sup>2</sup>	C1= 0.35	474m <sup>2</sup>
Paved Areas	A2= 753m <sup>2</sup>	C2= 0.85	640m <sup>2</sup>
Roof	A3= 721m <sup>2</sup>	C2= 0.90	649m <sup>2</sup>
<b>Total</b>	<b>2828m<sup>2</sup></b>	<b>Total Effective Area:</b>	<b>1763m<sup>2</sup></b>

Post-development Catchments			
Surface:	Catchment Areas:	Runoff Coefficients:	Effective Areas:
Landscape	A1= 854m <sup>2</sup>	C1= 0.35	299m <sup>2</sup>
Paved Area NW	A2= 487m <sup>2</sup>	C2= 0.95	463m <sup>2</sup>
Paved Area SE	A3= 1445m <sup>2</sup>	C2= 0.95	1373m <sup>2</sup>
<b>Total</b>	<b>2786m<sup>2</sup></b>	<b>Total Effective Area:</b>	<b>2134m<sup>2</sup></b>

**Rainfall**

Source = Wellington City HIRDS V4 Historical Data + 20%  
Storm Return Period = 10 Years

**Rainfall Intensity Data:**

Source : Wellington City HIRDS V4 Historical Data + 20%

Duration	Depth (mm)
10	14.52
20	21
30	25.92
60	36.72
120	50.88
360	81.6
720	81.1

**Storage**

	Invert R.L.	Max Depth	Volume	Net void ratio	Effective Volume	Outlets				Maximum fill %
						Low Level Aperture	Low Level Invert	Mid Level Aperture	Mid Level Invert	
Paved Area NW	0.0m	0.800m	2.94m <sup>3</sup>	1.00	2.9m <sup>3</sup>	156mm	0.00m	75m	0.500m	57%

**Pre vs Post-development Peak Runoff**

Rainfall intensity = 105mm/hr

Scenario	Effective Catchment Area:	Peak Runoff Flow:	Delta:
Pre-development	A1= 1875m <sup>2</sup>	Q1= 54.4L/s	
Post-development unattenuated	A2= 762m <sup>2</sup>	Q2= 22.1L/s	-32.3L/s
Post-development attenuated	A3= 1373m <sup>2</sup>	Q3= 32.3L/s	-0.0L/s

Orifice outlet flow governed by Equation 12 of TR2013/018:  $Q = 0.62A(2gh)^{0.5}$

A = area of orifice  
g = gravitational acceleration  
h = elevation head acting on the orifice centreline

**Stormwater Attenuation Design (10-Year)**  
Wellington Water 12-hour nested rainfall distribution

Project:	New World Khandallah Car Park expansion	Revision:	B
Job Number:	712722	By:	DBS
		Date:	12.04.22
		Checked:	SW
		Date:	

Analysis		Paved Area NW									
Time	Incremental Rainfall (mm)	Runoff (m3)	Cumulative Volume	Stored Water Depth	Discharge (Low Level) (m3)	Discharge (Mid Level) (m3)	Discharge (High Level) (m3)	Discharge Rate (m3/s)	Stored Volume (m3)	Percentage Full	
0:00	0.00	0.00	0	0	0	0	0	0.000	0.00	0%	
0:05	-0.01	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:10	-0.01	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:15	-0.01	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:20	-0.01	0.00	-0.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:25	-0.01	0.00	-0.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:30	-0.01	0.00	-0.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:35	-0.01	0.00	-0.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:40	-0.01	0.00	-0.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:45	-0.01	0.00	-0.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:50	-0.01	0.00	-0.02	0.000	0.000	0.000	0.000	0.000	0.00	0%	
0:55	-0.01	0.00	-0.02	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:00	-0.01	0.00	-0.02	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:05	-0.01	0.00	-0.02	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:10	-0.01	0.00	-0.02	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:15	-0.01	0.00	-0.02	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:20	-0.01	0.00	-0.03	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:25	-0.01	0.00	-0.03	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:30	-0.01	0.00	-0.03	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:35	-0.01	0.00	-0.03	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:40	-0.01	0.00	-0.03	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:45	-0.01	0.00	-0.03	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:50	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
1:55	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:00	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:05	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:10	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:15	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:20	-0.01	0.00	-0.04	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:25	-0.01	0.00	-0.05	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:30	-0.01	0.00	-0.05	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:35	-0.01	0.00	-0.05	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:40	-0.01	0.00	-0.05	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:45	-0.01	0.00	-0.05	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:50	-0.01	0.00	-0.05	0.000	0.000	0.000	0.000	0.000	0.00	0%	
2:55	-0.01	0.00	-0.06	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:00	-0.01	0.00	-0.06	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:05	-0.01	0.00	-0.06	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:10	-0.01	0.00	-0.06	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:15	-0.01	0.00	-0.06	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:20	-0.01	0.00	-0.06	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:25	-0.01	0.00	-0.07	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:30	-0.01	0.00	-0.07	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:35	-0.01	0.00	-0.07	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:40	-0.01	0.00	-0.07	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:45	-0.01	0.00	-0.07	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:50	-0.01	0.00	-0.07	0.000	0.000	0.000	0.000	0.000	0.00	0%	
3:55	-0.01	0.00	-0.08	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:00	-0.01	0.00	-0.08	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:05	-0.01	0.00	-0.08	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:10	-0.01	0.00	-0.08	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:15	-0.01	0.00	-0.08	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:20	-0.01	0.00	-0.08	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:25	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:30	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:35	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:40	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:45	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:50	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
4:55	-0.01	0.00	-0.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
5:00	-0.01	0.00	-0.10	0.000	0.000	0.000	0.000	0.000	0.00	0%	
5:05	0.64	0.15	0.05	0.040	0.000	0.000	0.000	0.000	0.15	5%	
5:10	0.64	0.15	0.20	0.081	0.798	0.000	0.000	0.003	0.30	10%	
5:15	0.64	0.15	0.35	0.000	0.000	0.000	0.000	0.000	0.00	0%	
5:20	0.64	0.15	0.50	0.040	0.000	0.000	0.000	0.000	0.15	5%	
5:25	0.64	0.15	0.64	0.081	0.798	0.000	0.000	0.003	0.30	10%	
5:30	0.64	0.15	0.79	0.000	0.000	0.000	0.000	0.000	0.00	0%	
5:35	0.64	0.15	0.94	0.040	0.000	0.000	0.000	0.000	0.15	5%	
5:40	0.64	0.15	1.09	0.081	0.798	0.000	0.000	0.003	0.30	10%	
5:45	0.64	0.15	1.24	0.000	0.000	0.000	0.000	0.000	0.00	0%	
5:50	0.64	0.15	1.38	0.040	0.000	0.000	0.000	0.000	0.15	5%	
5:55	0.64	0.15	1.53	0.081	0.798	0.000	0.000	0.003	0.30	10%	
6:00	0.64	0.15	1.68	0.000	0.000	0.000	0.000	0.000	0.00	0%	
6:05	0.64	0.15	1.83	0.040	0.000	0.000	0.000	0.000	0.15	5%	
6:10	0.64	0.15	1.98	0.081	0.798	0.000	0.000	0.003	0.30	10%	
6:15	0.64	0.15	2.12	0.000	0.000	0.000	0.000	0.000	0.00	0%	
6:20	0.64	0.15	2.27	0.040	0.000	0.000	0.000	0.000	0.15	5%	
6:25	0.64	0.15	2.42	0.081	0.798	0.000	0.000	0.003	0.30	10%	
6:30	0.64	0.15	2.57	0.000	0.000	0.000	0.000	0.000	0.00	0%	
6:35	0.64	0.15	2.72	0.040	0.000	0.000	0.000	0.000	0.15	5%	
6:40	0.64	0.15	2.86	0.081	0.798	0.000	0.000	0.003	0.30	10%	
6:45	0.64	0.15	3.01	0.000	0.000	0.000	0.000	0.000	0.00	0%	
6:50	0.64	0.15	3.16	0.040	0.000	0.000	0.000	0.000	0.15	5%	
6:55	0.64	0.15	3.31	0.081	0.798	0.000	0.000	0.003	0.30	10%	
7:00	0.64	0.15	3.46	0.000	0.000	0.000	0.000	0.000	0.00	0%	
7:05	1.18	0.27	3.73	0.074	0.000	0.000	0.000	0.000	0.27	9%	
7:10	1.18	0.27	4.00	0.149	4.183	0.000	0.000	0.014	0.55	19%	
7:15	1.18	0.27	4.28	0.000	0.000	0.000	0.000	0.000	0.00	0%	
7:20	1.18	0.27	4.55	0.074	0.000	0.000	0.000	0.000	0.27	9%	
7:25	1.18	0.27	4.82	0.149	4.183	0.000	0.000	0.014	0.55	19%	
7:30	1.18	0.27	5.09	0.000	0.000	0.000	0.000	0.000	0.00	0%	
7:35	1.80	0.42	5.51	0.113	2.959	0.000	0.000	0.010	0.42	14%	
7:40	1.80	0.42	5.93	0.000	0.000	0.000	0.000	0.000	0.00	0%	
7:45	1.80	0.42	6.34	0.113	2.959	0.000	0.000	0.010	0.42	14%	
7:50	2.46	0.57	6.91	0.000	0.000	0.000	0.000	0.000	0.00	0%	
7:55	3.24	0.75	7.66	0.204	5.588	0.000	0.000	0.019	0.75	25%	
8:00	7.26	1.68	9.34	0.000	0.000	0.000	0.000	0.000	0.00	0%	
8:05	7.26	1.68	11.02	0.457	9.694	0.000	0.000	0.032	1.68	57%	
8:10	3.24	0.75	11.77	0.000	0.000	0.000	0.000	0.000	0.00	0%	
8:15	2.46	0.57	12.34	0.155	4.365	0.000	0.000	0.015	0.57	19%	
8:20	1.80	0.42	12.76	0.000	0.000	0.000	0.000	0.000	0.00	0%	
8:25	1.80	0.42	13.17	0.113	2.959	0.000	0.000	0.010	0.42	14%	
8:30	1.80	0.42	13.59	0.000	0.000	0.000	0.000	0.000	0.00	0%	
8:35	1.18	0.27	13.86	0.074	0.000	0.000	0.000	0.000	0.27	9%	
8:40	1.18	0.27	14.13	0.149	4.183	0.000	0.000	0.014	0.55	19%	
8:45	1.18	0.27	14.41	0.000	0.000	0.000	0.000	0.000	0.00	0%	
8:50	1.18	0.27	14.68	0.074	0.000	0.000	0.000	0.000	0.27	9%	
8:55	1.18	0.27	14.95	0.149	4.183	0.000	0.000	0.014	0.55	19%	
9:00	1.18	0.27	15.23	0.000	0.000	0.000	0.000	0.000	0.00	0%	
9:05	0.64	0.15	15.37	0.040	0.000	0.000	0.000	0.000	0.15	5%	
9:10	0.64	0.15	15.52	0.081	0.798	0.000	0.000	0.003	0.30	10%	

**Stormwater Attenuation Design (10-Year)**

Wellington Water 12-hour nested rainfall distribution

Project:	New World Khandallah Car Park expansion	Revision:	B
Job Number:	712722	By:	DBS
		Date:	12.04.22
		Checked:	SW
		Date:	

9:15	0.64	0.15	15.67	0.000	0.000	0.000	0.000	0.000	0.00	0%
9:20	0.64	0.15	15.82	0.040	0.000	0.000	0.000	0.000	0.15	5%
9:25	0.64	0.15	15.97	0.081	0.798	0.000	0.000	0.003	0.30	10%
9:30	0.64	0.15	16.11	0.000	0.000	0.000	0.000	0.000	0.00	0%
9:35	0.64	0.15	16.26	0.040	0.000	0.000	0.000	0.000	0.15	5%
9:40	0.64	0.15	16.41	0.081	0.798	0.000	0.000	0.003	0.30	10%
9:45	0.64	0.15	16.56	0.000	0.000	0.000	0.000	0.000	0.00	0%
9:50	0.64	0.15	16.71	0.040	0.000	0.000	0.000	0.000	0.15	5%
9:55	0.64	0.15	16.86	0.081	0.798	0.000	0.000	0.003	0.30	10%
10:00	0.64	0.15	17.00	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:05	0.64	0.15	17.15	0.040	0.000	0.000	0.000	0.000	0.15	5%
10:10	0.64	0.15	17.30	0.081	0.798	0.000	0.000	0.003	0.30	10%
10:15	0.64	0.15	17.45	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:20	0.64	0.15	17.60	0.040	0.000	0.000	0.000	0.000	0.15	5%
10:25	0.64	0.15	17.74	0.081	0.798	0.000	0.000	0.003	0.30	10%
10:30	0.64	0.15	17.89	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:35	0.64	0.15	18.04	0.040	0.000	0.000	0.000	0.000	0.15	5%
10:40	0.64	0.15	18.19	0.081	0.798	0.000	0.000	0.003	0.30	10%
10:45	0.64	0.15	18.34	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:50	0.64	0.15	18.48	0.040	0.000	0.000	0.000	0.000	0.15	5%
10:55	0.64	0.15	18.63	0.081	0.798	0.000	0.000	0.003	0.30	10%
11:00	0.64	0.15	18.78	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:05	-0.01	0.00	18.78	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:10	-0.01	0.00	18.78	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:15	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:20	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:25	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:30	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:35	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:40	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:45	-0.01	0.00	18.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:50	-0.01	0.00	18.76	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:55	-0.01	0.00	18.76	0.000	0.000	0.000	0.000	0.000	0.00	0%
12:00	-0.01	0.00	18.76	0.000	0.000	0.000	0.000	0.000	0.00	0%
12:05	0.00	0.00	18.76	0.000	0.000	0.000	0.000	0.000	0.00	0%

**Stormwater Attenuation Design (100-Year)**  
Wellington Water 12-hour nested rainfall distribution

Project:	New World Khandallah Car Park expansion	Revision:	B
Job Number:	712722	By:	DBS
		Date:	12.04.22
		Checked:	SW
		Date:	19.04.22

**Pre-development Catchments**

Surface:	Catchment Areas:	Runoff Coefficients:	Effective Areas:
Landscape	A1= 1354m <sup>2</sup>	C1= 0.35	474m <sup>2</sup>
Paved Areas	A2= 753m <sup>2</sup>	C2= 0.95	715m <sup>2</sup>
Roof	A3= 721m <sup>2</sup>	C2= 0.95	685m <sup>2</sup>
<b>Total:</b>	<b>2828m<sup>2</sup></b>	<b>Total Effective Area:</b>	<b>1875m<sup>2</sup></b>

**Post-development Catchments**

Surface:	Catchment Areas:	Runoff Coefficients:	Effective Areas:
Landscape	A1= 854m <sup>2</sup>	C1= 0.35	299m <sup>2</sup>
Paved Area NW	A2= 487m <sup>2</sup>	C2= 0.95	463m <sup>2</sup>
Paved Area SE	A3= 1445m <sup>2</sup>	C2= 0.95	1373m <sup>2</sup>
<b>Total:</b>	<b>2786m<sup>2</sup></b>	<b>Total Effective Area:</b>	<b>2134m<sup>2</sup></b>

- 1 L L free
- 2 L P sf
- 3 R L free
- 4 R P sump, tank

**Rainfall**

Source = Wellington City HIRDS V4 Historical Data + 20%  
Storm Return Period = 100 Years

**Rainfall Intensity Data:**  
Source : Wellington City HIRDS V4 Historical Data + 20%

Duration	Depth (mm)
10	22.8
20	32.88
30	40.44
60	56.76
120	78.24
360	123.6
720	160.8

**Storage** **Outlets**

	Invert R. L.	Max Depth	Volume	Net void ratio	Effective Volume	Low Level Aperture	Low Level Invert	Mid Level Aperture	Mid Level Invert	Maximum fill %
Paved Area NW	0.0m	0.800m	2.94m <sup>3</sup>	0.90	2.6m <sup>3</sup>	156mm	0.00m	75mm	0.500m	100%

**Pre vs Post-development Peak Runoff**

Rainfall intensity = 164mm/hr

Scenario	Effective Catchment Area:	Peak Runoff Flow:	Delta:
Pre-development	A1= 1875m <sup>2</sup>	Q1= 85.5L/s	
Post-development unattenuated	A2= 762m <sup>2</sup>	Q2= 34.7L/s	-50.8L/s
Post-development attenuated	A3= 1373m <sup>2</sup>	Q3= 50.8L/s	-0.0L/s

10 year  
-0.0L/s

Orifice outlet flow governed by Equation 12 of TR2013/018:  $Q = 0.62A(2gh)^{0.5}$

A = area of orifice  
g = gravitational acceleration  
h = elevation head acting on the orifice centreline

# Stormwater Attenuation Design (100-Year)

Wellington Water 12-hour nested rainfall distribution

Project:	New World Khandallah Car Park expansion	Revision:	B
Job Number:	712722	By:	DBS
		Date:	12.04.22
		Checked:	SW
		Date:	19.04.22

## Analysis

		Paved Area NW								
Time	Incremental Rainfall (mm)	Runoff (m3)	Cumulative Volume	Stored Water Depth	Discharge (Low Level) (m3)	Discharge (Mid Level) (m3)	Discharge (High Level) (m3)	Discharge Rate (m3/s)	Stored Volume (m3)	Percentage Full
0:00	0.00	0.00	0	0	0	0	0	0.000	0.00	0%
0:05	0.52	0.12	0.12	0.036	0.000	0.000	0.000	0.000	0.12	5%
0:10	0.52	0.12	0.24	0.072	0.000	0.000	0.000	0.000	0.24	9%
0:15	0.52	0.12	0.36	0.108	0.000	0.000	0.000	0.009	0.36	14%
0:20	0.52	0.12	0.48	0.000	0.000	0.000	0.000	0.000	0.00	0%
0:25	0.52	0.12	0.60	0.036	0.000	0.000	0.000	0.000	0.12	5%
0:30	0.52	0.12	0.72	0.072	0.000	0.000	0.000	0.000	0.24	9%
0:35	0.52	0.12	0.84	0.108	0.000	0.000	0.000	0.009	0.36	14%
0:40	0.52	0.12	0.96	0.000	0.000	0.000	0.000	0.000	0.00	0%
0:45	0.52	0.12	1.08	0.036	0.000	0.000	0.000	0.000	0.12	5%
0:50	0.52	0.12	1.20	0.072	0.000	0.000	0.000	0.000	0.24	9%
0:55	0.52	0.12	1.31	0.108	0.000	0.000	0.000	0.009	0.36	14%
1:00	0.52	0.12	1.43	0.000	0.000	0.000	0.000	0.000	0.00	0%
1:05	0.52	0.12	1.55	0.036	0.000	0.000	0.000	0.000	0.12	5%
1:10	0.52	0.12	1.67	0.072	0.000	0.000	0.000	0.000	0.24	9%
1:15	0.52	0.12	1.79	0.108	0.000	0.000	0.000	0.009	0.36	14%
1:20	0.52	0.12	1.91	0.000	0.000	0.000	0.000	0.000	0.00	0%
1:25	0.52	0.12	2.03	0.036	0.000	0.000	0.000	0.000	0.12	5%
1:30	0.52	0.12	2.15	0.072	0.000	0.000	0.000	0.000	0.24	9%
1:35	0.52	0.12	2.27	0.108	0.000	0.000	0.000	0.009	0.36	14%
1:40	0.52	0.12	2.39	0.000	0.000	0.000	0.000	0.000	0.00	0%
1:45	0.52	0.12	2.51	0.036	0.000	0.000	0.000	0.000	0.12	5%
1:50	0.52	0.12	2.63	0.072	0.000	0.000	0.000	0.000	0.24	9%
1:55	0.52	0.12	2.75	0.108	0.000	0.000	0.000	0.009	0.36	14%
2:00	0.52	0.12	2.87	0.000	0.000	0.000	0.000	0.000	0.00	0%
2:05	0.52	0.12	2.99	0.036	0.000	0.000	0.000	0.000	0.12	5%
2:10	0.52	0.12	3.11	0.072	0.000	0.000	0.000	0.000	0.24	9%
2:15	0.52	0.12	3.23	0.108	0.000	0.000	0.000	0.009	0.36	14%
2:20	0.52	0.12	3.35	0.000	0.000	0.000	0.000	0.000	0.00	0%
2:25	0.52	0.12	3.47	0.036	0.000	0.000	0.000	0.000	0.12	5%
2:30	0.52	0.12	3.59	0.072	0.000	0.000	0.000	0.000	0.24	9%
2:35	0.52	0.12	3.71	0.108	0.000	0.000	0.000	0.009	0.36	14%
2:40	0.52	0.12	3.82	0.000	0.000	0.000	0.000	0.000	0.00	0%
2:45	0.52	0.12	3.94	0.036	0.000	0.000	0.000	0.000	0.12	5%
2:50	0.52	0.12	4.06	0.072	0.000	0.000	0.000	0.000	0.24	9%
2:55	0.52	0.12	4.18	0.108	0.000	0.000	0.000	0.009	0.36	14%
3:00	0.52	0.12	4.30	0.000	0.000	0.000	0.000	0.000	0.00	0%
3:05	0.52	0.12	4.42	0.036	0.000	0.000	0.000	0.000	0.12	5%
3:10	0.52	0.12	4.54	0.072	0.000	0.000	0.000	0.000	0.24	9%
3:15	0.52	0.12	4.66	0.108	0.000	0.000	0.000	0.009	0.36	14%
3:20	0.52	0.12	4.78	0.000	0.000	0.000	0.000	0.000	0.00	0%
3:25	0.52	0.12	4.90	0.036	0.000	0.000	0.000	0.000	0.12	5%
3:30	0.52	0.12	5.02	0.072	0.000	0.000	0.000	0.000	0.24	9%
3:35	0.52	0.12	5.14	0.108	0.000	0.000	0.000	0.009	0.36	14%
3:40	0.52	0.12	5.26	0.000	0.000	0.000	0.000	0.000	0.00	0%
3:45	0.52	0.12	5.38	0.036	0.000	0.000	0.000	0.000	0.12	5%
3:50	0.52	0.12	5.50	0.072	0.000	0.000	0.000	0.000	0.24	9%
3:55	0.52	0.12	5.62	0.108	0.000	0.000	0.000	0.009	0.36	14%
4:00	0.52	0.12	5.74	0.000	0.000	0.000	0.000	0.000	0.00	0%
4:05	0.52	0.12	5.86	0.036	0.000	0.000	0.000	0.000	0.12	5%
4:10	0.52	0.12	5.98	0.072	0.000	0.000	0.000	0.000	0.24	9%
4:15	0.52	0.12	6.10	0.108	0.000	0.000	0.000	0.009	0.36	14%
4:20	0.52	0.12	6.21	0.000	0.000	0.000	0.000	0.000	0.00	0%
4:25	0.52	0.12	6.33	0.036	0.000	0.000	0.000	0.000	0.12	5%
4:30	0.52	0.12	6.45	0.072	0.000	0.000	0.000	0.000	0.24	9%
4:35	0.52	0.12	6.57	0.108	0.000	0.000	0.000	0.009	0.36	14%
4:40	0.52	0.12	6.69	0.000	0.000	0.000	0.000	0.000	0.00	0%
4:45	0.52	0.12	6.81	0.036	0.000	0.000	0.000	0.000	0.12	5%
4:50	0.52	0.12	6.93	0.072	0.000	0.000	0.000	0.000	0.24	9%
4:55	0.52	0.12	7.05	0.108	0.000	0.000	0.000	0.009	0.36	14%
5:00	0.52	0.12	7.17	0.000	0.000	0.000	0.000	0.000	0.00	0%
5:05	0.95	0.22	7.39	0.066	0.000	0.000	0.000	0.000	0.22	8%
5:10	0.95	0.22	7.61	0.132	3.666	0.000	0.000	0.012	0.44	17%
5:15	0.95	0.22	7.83	0.000	0.000	0.000	0.000	0.000	0.00	0%
5:20	0.95	0.22	8.05	0.066	0.000	0.000	0.000	0.000	0.22	8%
5:25	0.95	0.22	8.26	0.132	3.666	0.000	0.000	0.012	0.44	17%
5:30	0.95	0.22	8.48	0.000	0.000	0.000	0.000	0.000	0.00	0%
5:35	0.95	0.22	8.70	0.066	0.000	0.000	0.000	0.000	0.22	8%
5:40	0.95	0.22	8.92	0.132	3.666	0.000	0.000	0.012	0.44	17%
5:45	0.95	0.22	9.14	0.000	0.000	0.000	0.000	0.000	0.00	0%
5:50	0.95	0.22	9.36	0.066	0.000	0.000	0.000	0.000	0.22	8%
5:55	0.95	0.22	9.58	0.132	3.666	0.000	0.000	0.012	0.44	17%
6:00	0.95	0.22	9.79	0.000	0.000	0.000	0.000	0.000	0.00	0%
6:05	0.95	0.22	10.01	0.066	0.000	0.000	0.000	0.000	0.22	8%
6:10	0.95	0.22	10.23	0.132	3.666	0.000	0.000	0.012	0.44	17%
6:15	0.95	0.22	10.45	0.000	0.000	0.000	0.000	0.000	0.00	0%
6:20	0.95	0.22	10.67	0.066	0.000	0.000	0.000	0.000	0.22	8%
6:25	0.95	0.22	10.89	0.132	3.666	0.000	0.000	0.012	0.44	17%
6:30	0.95	0.22	11.11	0.000	0.000	0.000	0.000	0.000	0.00	0%
6:35	0.95	0.22	11.32	0.066	0.000	0.000	0.000	0.000	0.22	8%
6:40	0.95	0.22	11.54	0.132	3.666	0.000	0.000	0.012	0.44	17%
6:45	0.95	0.22	11.76	0.000	0.000	0.000	0.000	0.000	0.00	0%
6:50	0.95	0.22	11.98	0.066	0.000	0.000	0.000	0.000	0.22	8%
6:55	0.95	0.22	12.20	0.132	3.666	0.000	0.000	0.012	0.44	17%
7:00	0.95	0.22	12.42	0.000	0.000	0.000	0.000	0.000	0.00	0%
7:05	1.79	0.41	12.83	0.125	3.421	0.000	0.000	0.011	0.41	16%
7:10	1.79	0.41	13.25	0.000	0.000	0.000	0.000	0.000	0.00	0%
7:15	1.79	0.41	13.66	0.125	3.421	0.000	0.000	0.011	0.41	16%
7:20	1.79	0.41	14.07	0.000	0.000	0.000	0.000	0.000	0.00	0%
7:25	1.79	0.41	14.49	0.125	3.421	0.000	0.000	0.011	0.41	16%
7:30	1.79	0.41	14.90	0.000	0.000	0.000	0.000	0.000	0.00	0%
7:35	2.72	0.63	15.53	0.190	5.276	0.000	0.000	0.018	0.63	24%
7:40	2.72	0.63	16.16	0.000	0.000	0.000	0.000	0.000	0.00	0%
7:45	2.72	0.63	16.79	0.190	5.276	0.000	0.000	0.018	0.63	24%
7:50	3.78	0.87	17.66	0.000	0.000	0.000	0.000	0.000	0.00	0%
7:55	5.04	1.17	18.83	0.352	8.250	0.000	0.000	0.028	1.17	44%
8:00	11.40	2.64	21.47	0.000	0.000	0.000	0.000	0.000	0.00	0%
8:05	11.40	2.64	24.10	0.797	13.355	1.870	0.000	0.051	2.64	100%
8:10	5.04	1.17	25.27	0.000	0.000	0.000	0.000	0.000	0.00	0%
8:15	3.78	0.87	26.14	0.264	6.798	0.000	0.000	0.023	0.87	33%
8:20	2.72	0.63	26.77	0.000	0.000	0.000	0.000	0.000	0.00	0%
8:25	2.72	0.63	27.40	0.190	5.276	0.000	0.000	0.018	0.63	24%
8:30	2.72	0.63	28.03	0.000	0.000	0.000	0.000	0.000	0.00	0%
8:35	1.79	0.41	28.45	0.125	3.421	0.000	0.000	0.011	0.41	16%
8:40	1.79	0.41	28.86	0.000	0.000	0.000	0.000	0.000	0.00	0%
8:45	1.79	0.41	29.27	0.125	3.421	0.000	0.000	0.011	0.41	16%
8:50	1.79	0.41	29.69	0.000	0.000	0.000	0.000	0.000	0.00	0%
8:55	1.79	0.41	30.10	0.125	3.421	0.000	0.000	0.011	0.41	16%
9:00	1.79	0.41	30.52	0.000	0.000	0.000	0.000	0.000	0.00	0%
9:05	0.95	0.22	30.73	0.066	0.000	0.000	0.000	0.000	0.22	8%
9:10	0.95	0.22	30.95	0.132	3.666	0.000	0.000	0.012	0.44</	

**Stormwater Attenuation Design (100-Year)**

Wellington Water 12-hour nested rainfall distribution

Project:	New World Khandallah Car Park expansion	Revision:	B
Job Number:	712722	By:	DBS
		Date:	12.04.22
		Checked:	SW
		Date:	19.04.22

9:20	0.95	0.22	31.39	0.066	0.000	0.000	0.000	0.000	0.22	8%
9:25	0.95	0.22	31.61	0.132	3.666	0.000	0.000	0.012	0.44	17%
9:30	0.95	0.22	31.83	0.000	0.000	0.000	0.000	0.000	0.00	0%
9:35	0.95	0.22	32.05	0.066	0.000	0.000	0.000	0.000	0.22	8%
9:40	0.95	0.22	32.27	0.132	3.666	0.000	0.000	0.012	0.44	17%
9:45	0.95	0.22	32.48	0.000	0.000	0.000	0.000	0.000	0.00	0%
9:50	0.95	0.22	32.70	0.066	0.000	0.000	0.000	0.000	0.22	8%
9:55	0.95	0.22	32.92	0.132	3.666	0.000	0.000	0.012	0.44	17%
10:00	0.95	0.22	33.14	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:05	0.95	0.22	33.36	0.066	0.000	0.000	0.000	0.000	0.22	8%
10:10	0.95	0.22	33.58	0.132	3.666	0.000	0.000	0.012	0.44	17%
10:15	0.95	0.22	33.80	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:20	0.95	0.22	34.01	0.066	0.000	0.000	0.000	0.000	0.22	8%
10:25	0.95	0.22	34.23	0.132	3.666	0.000	0.000	0.012	0.44	17%
10:30	0.95	0.22	34.45	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:35	0.95	0.22	34.67	0.066	0.000	0.000	0.000	0.000	0.22	8%
10:40	0.95	0.22	34.89	0.132	3.666	0.000	0.000	0.012	0.44	17%
10:45	0.95	0.22	35.11	0.000	0.000	0.000	0.000	0.000	0.00	0%
10:50	0.95	0.22	35.33	0.066	0.000	0.000	0.000	0.000	0.22	8%
10:55	0.95	0.22	35.54	0.132	3.666	0.000	0.000	0.012	0.44	17%
11:00	0.95	0.22	35.76	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:05	0.52	0.12	35.88	0.036	0.000	0.000	0.000	0.000	0.12	5%
11:10	0.52	0.12	36.00	0.072	0.000	0.000	0.000	0.000	0.24	9%
11:15	0.52	0.12	36.12	0.108	2.746	0.000	0.000	0.009	0.36	14%
11:20	0.52	0.12	36.24	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:25	0.52	0.12	36.36	0.036	0.000	0.000	0.000	0.000	0.12	5%
11:30	0.52	0.12	36.48	0.072	0.000	0.000	0.000	0.000	0.24	9%
11:35	0.52	0.12	36.60	0.108	2.746	0.000	0.000	0.009	0.36	14%
11:40	0.52	0.12	36.72	0.000	0.000	0.000	0.000	0.000	0.00	0%
11:45	0.52	0.12	36.84	0.036	0.000	0.000	0.000	0.000	0.12	5%
11:50	0.52	0.12	36.96	0.072	0.000	0.000	0.000	0.000	0.24	9%
11:55	0.52	0.12	37.08	0.108	2.746	0.000	0.000	0.009	0.36	14%
12:00	0.52	0.12	37.20	0.000	0.000	0.000	0.000	0.000	0.00	0%
12:05	0.00	0.00	37.20	0.000	0.000	0.000	0.000	0.000	0.00	0%

**ESTIMATION OF SEDIMENT YIELD  
BY THE UNIVERSAL SOIL LOSS EQUATION**



**EXISTING SITE**

**PROJECT DATA**

PROJECT NO.: 712722      DATE: 19/04/2022      BY: YW      CHECKED: SW

SITE DESCRIPTION: New World Khandallah

**PRE-EARTHWORKS 4 MONTH PERIOD**

**CATCHMENT:**

WORKING DURATION (years):

WORKING AREA (ha):

	Area A				
	0.33				
	0.28				

**WORKING FORMULA (USLE)**

$A^* = R K L S C P$  ; Where A = soil loss (tonnes/ha/year)

Rainfall erosion index (R):

$R = 0.00828 * (P)^{2.2 * 1.70}$

; Where P = the rainfall figure from 6 hours duration 2 years storm event

2 yr ARI	(24hr)	78	mm	
	P =	48.98	mm	(P = 2yrARI * 0.628)
	R =	73.6		

Soil erodibility index (K):

(from triangular nomograph)  
(generally silty, some clay to clayey)      Assumed 20% Clay and 80% Silt

	Area A				
K=	0.37				
K <sub>metric</sub> =	0.49				

Slope length and steepness factor (LS):

Longest length high to low  
Mean grade/slope (all triang

	Upstream	Area A			
Length (m) =		50			
Slope (%) =		6.50			
m =		0.72			
LS =		1.145			

Vegetation cover factor and Erosion control practice factor (C & P):

temporary grass

	Upstream	Area A			
C =		0.1			
P =		1			

Sediment Delivery Ratio (SDR) & Sediment Control Efficiency (SCE):\*\*

SDR =	0.6	assume vegetation & depressions trap sediments
SCE =	0.9	Assume natural vegetation retains 90% of potential runoff

\*\* The USLE predicts the total yield of sediment generated but makes no allowance for that retained on site. A Sediment Delivery Ratio (SDR) must be selected. American sources state that SDR rates range mostly from 10% to 70% (N.Y. Guidelines for Urban Erosion and Sediment Control)



**ESTIMATION OF SEDIMENT YIELD  
BY THE UNIVERSAL SOIL LOSS EQUATION**



**EXISTING SITE**

**ESTIMATION OF SEDIMENT**

SECTION	TIME (YEAR)	AREA (ha)	USLE PARAMETERS					SDR	SCE
			R	K	LS	C	P		
AREA A	0.33	0.2800	73.55	0.4884	1.1448085	0.1	1	0.6	0.9

SECTION	EST.GROSS SEDIMENT YIELD (tonnes)	NET SEDIMENT LOSS (tonnes)
AREA A	0.38	0.02

SEDIMENT GENERATION POTENTIAL (tonnes)	0.38
ESTIMATED TOTAL NET SEDIMENT LOSS (tonnes)	0.02

**ESTIMATION OF SEDIMENT YIELD  
BY THE UNIVERSAL SOIL LOSS EQUATION**



**PROJECT DATA**

PROJECT NO.: 712722      DATE: Apr-22      BY: YW      CHECKED: SW

SITE DESCRIPTION: New World Khandallah

**EARTHWORKS 4 MONTH PERIOD**

**CATCHMENT:**

WORKING DURATION (years):

WORKING AREA (ha):

Upstream	Area A	Area B	Area C	Area D	Area E
	0.33				
	0.28				

**WORKING FORMULA (USLE)**

$A^* = R K L S C P$  ; Where A = soil loss (tonnes/ha/year)

Rainfall erosion index (R):

$R = 0.00828 * (P)^{2.2 * 1.70}$

; Where P = the rainfall figure from 6 hours duration 2 years storm event

2 yr ARI	(24hr)	78	mm	
	P =	48.98	mm	(P = 2yrARI * 0.628)
	R =	73.6		

Soil erodibility index (K):

(from triangular nomograph)

(generally silty, some clay to clayey) Assumed 20% Clay and 80% Silt

	Upstream	Area A	Area B	Area C	Area D	Area E
K=		0.37				
K <sub>metric</sub> =		0.49				

Slope length and steepness factor (LS):

Longest length high to low  
Assume no change in average

	Upstream	Area A	Area B	Area C	Area D	Area E
Length (m) =		50				
Slope (%) =		6.50				
m =		0.72				
LS =		1.145				

Vegetation cover factor and Erosion control practice factor (C & P):

temporary grass

	Upstream	Area A	Area B	Area C	Area D	Area E
Bare soil C =		1				
Compacted and smooth P =		1.32				

Sediment Delivery Ratio (SDR) & Sediment Control Efficiency (SCE):\*\*

SDR =	0.5	
SCE =	0.7	Decanting earthbunds

\*\* The USLE predicts the total yield of sediment generated but makes no allowance for that retained on site. A Sediment Delivery Ratio (SDR) must be selected. American sources state that SDR rates range mostly from 10% to 70% (N.Y. Guidelines for Urban Erosion and Sediment Control)

**ESTIMATION OF SEDIMENT YIELD  
BY THE UNIVERSAL SOIL LOSS EQUATION**



**ESTIMATION OF SEDIMENT**

Decanting Earthbunds

SECTION	TIME (YEAR)	AREA (ha)	USLE PARAMETERS					SDR	SCE <sub>(Floc)</sub>
			R	K	LS	C	P		
AREA A	0.33	0.2800	73.55	0.4884	1.145	1	1.32	0.5	0.7

SECTION	EST.GROSS SEDIMENT YIELD (tonnes)	NET SEDIMENT LOSS (tonnes)
AREA A	5.02	0.75

SEDIMENT GENERATION POTENTIAL (tonnes)	5.02
ESTIMATED TOTAL NET SEDIMENT LOSS (tonnes)	0.75

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## Appendix C Retaining Wall Notes

## Retaining Walls

Timber retaining walls are proposed for the car park. The largest retaining wall is up to 3.4m tall for the footpath along the southwest face of the supermarket.

Below we have summarised the construction methodology for the retaining walls.

- Bore holes for timber piles from existing ground level after topsoil removal.
- Place timber poles and pour concrete.
- Once the concrete has cured, place timber rails and nova coil (with socks), and back fill with scoria.
- Back fill the ground behind the retaining walls up to the required level.
- Continuously monitor for movement of ground and retaining wall whilst earth filling

The design will also consider

- Proximity to site boundary and buildings
- Drainage
- Adequate Sediment control measures shall be adopted in accordance with an approved earth work and sediment control plan. Sediment Control Silt fences are kept reasonably inside from the boundary until the timber poles for retaining walls are installed. They shall be moved along the boundary when earth cutting or filling starts with Railing installation



## Contact Us

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