

FINAL STORMWATER REPORT – STAGE 2

62,78,80 PAPAKURA-CLEVEDON ROAD

CLEVEDON

AUCKLAND



ARON KUMAR

Approved by Delegated Officer

23/05/2025

 Maven Associates	Job Number 194006		Rev C
Job Title Title 62,78,80 Papakura-Clevedon Road Final Stormwater Report – Stage 2	Author ML	Date 09/05/2025	Checked JD

1.0 INTRODUCTION

1.1 PROJECT

The purpose of this report is to provide an overland flow and flooding assessment associated with the proposed development at 62,78 & 80 Papakura-Clevedon Road, Clevedon, as identified within Figure 1 below.

This report provides information in support of an 224c application and is to be read in conjunction with the Engineering drawings and calculations within the Appendices.

1.2 SITE DESCRIPTION

The subject site is situated south of Papakura-Clevedon Road. The site is zoned as Single Housing Zone under the Auckland Unitary Plan ('AUP-OP') and is also under Clevedon Village sub-precincts A and B. The surrounding area is a mixture of rural and single housing residential zones.

Auckland Council Geomaps identifies Existing Overland flow paths (OLFP) and resultant 100-year floodplains. As shown in Figure 1 below, the existing site has one primary OLFP which is located within the central northern portion of the site and accounts for majority of the site. One other OLFP is located within the north-eastern portion of the site which flows north and joins with the primary OLFP. There are also minor OLFP generated within the site which flows towards the neighbouring properties.



Figure 1: Existing 100-YR OLFP and Floodplains

23/05/2025

1.3 RESOURCE CONSENT

The consented development at 62, 78 & 80 Papakura Clevedon Road is subject to conditions contained within Consent BUN60399307 (Stage 2). Condition 70 within the resource consent stipulates the following-

Prior to the application for the section 224(c) certificate, the consent holder must provide a Stormwater Report prepared by an appropriately qualified engineer to the satisfaction of the Council identifying:

- a. The 1% AEP flood level for the site and the surrounding road reserves.
- b. A layout plan of the overland flow paths for the site and the adjacent land along the boundary in accordance with the approved EPA before Section 223 approval.
- c. The overland flow path plan must include as-built cross sections of all roads including the ponding areas with levels before overtopping.
- d. As built longitudinal plan and cross sections must be provided for overland flow path locations.
- e. The minimum freeboard floor level of all habitable parts of buildings must be at least 150mm for flows below 2m³ per second and 100 mm deep and where flows exceed this, the minimum freeboard floor level of habitable parts of buildings must be increased to at least 500mm. This may be enforced through a consent notice on the property unless the building consents have already been issued.
- f. No buildings, structures or other obstructions are to be erected in the overland flow paths without prior written permission from the Council; and
- g. Where either existing or proposed overland flow paths cross lot boundaries, the consent holder is to provide the Council with plans to accompany easement(s) to be registered in favour of the Council. Any easement documentation is to be prepared by the consent holder's lawyers to the satisfaction of the Council's solicitors. All costs are to be at the consent holder's expense. The terms of these easements must prevent buildings, structures or other obstructions being erected in the overland flow path, and must require the landowner to maintain, weed and clean the overland flow paths to ensure an unobstructed flow of stormwater.

2.0 FLOOD MODELLING

2.1 MODELLING METHDOLOGY

Surface Model

Stormwater analysis has been carried out based on surveyed as-built information of the finished earthworks and roads.

Catchment area

The 100-year overland flows for each of the flooding cross-sections are determined by analysing the catchment areas derived from the as-built finished ground levels. These areas are classified into road areas and lot areas, each with distinct impervious-to-pervious ratios as represented in the table below.

TP108 Curve Numbers		
Area	Impervious Pervious Ratio	Curve Number
Lots	70/30	90.8
Roads	85/15	94.4

Each flooding cross-section has its own designated catchment area. The specific catchment areas are documented in the TP108 calculation sheets (**Appendix B**).

Channelisation factor

The channelization factor is applied to decrease the catchment response time, thereby facilitating higher flow velocities. The channelization factor of 0.6 is used following Auckland Council guidelines.

Overland Flow path Capacity

Cross-sections of the topography along the flow path were created from the roading as-built, depth of flow was calculated from Manning's calculation sheets. (**Appendix C**)

Note that Manning's values were applied in accordance with "Manning's n for Channels" - Chow, 1959

Manning's (n) values	
Road - Accessway	0.020

As a conservative approach, the piped stormwater network has been assumed to be fully blocked in a 100-year event and will not be considered to provide capacity for 100-year flows.

Flood Extent

The flood extent results from Mannings calculations are overlaid onto the as-built roading plan. The final flood levels are then used to establish the minimum floor levels for the lots, with the relevant freeboard requirements applied accordingly.

2.2 RESULTS SUMMARY

Flood Inundation Mapping

Following the results of the OLFP analysis along the cross-sections, the resultant flood extents associated with the 1% AEP rainfall event are contained within the road reserve.

Minimum Floor Levels (MFL)

As per the Auckland Council SWCoP and AUP requirements (Figure 2 below), freeboards of 150mm or 500mm are required over these OLFP peak flood levels.

The stormwater assessment confirms that all overland flow is contained within the road reserve, with no flooding anticipated within the residential lots. A 500mm freeboard has been applied where 100-year flow rates exceed $2.0\text{m}^3/\text{s}$, while a 150mm freeboard is applied for flows below this threshold.

Table 5: Freeboard requirements for the 1% AEP event flood plain and 1% AEP coastal storm inundation including 1 m sea-level rise

Scenario	Freeboard
More Vulnerable Activities* in floodplains	500 mm
Less Vulnerable Activities* in floodplains	300 mm
Overland flow paths where flow is less than $2\text{m}^3/\text{s}$	500 mm where surface water has a depth of 100 mm or more and extends from the building directly to a road or car park, other than a car park for a single dwelling 150 mm for all other cases
Overland flow paths, where flow is equal to or in excess of $2\text{m}^3/\text{s}$	500 mm for More Vulnerable Activities* 300 mm for Less Vulnerable Activities*
Coastal Storm Inundation Areas (1% AEP including 1m sea-level rise)	500 mm for dwellings and habitable rooms which are subject to wave action from the sea 150 mm for all other cases

Figure 2: AUP – OP Freeboard Requirements

Stage 2				
Lot Number	Final Flood Level (m)	Freeboard Required (m)	Auckland Vertical Datum 1946 MFL (m)	NZVD 2016 Datum MFL (m)
118	9.97	0.15	10.12	9.83
119	9.79	0.15	9.94	9.65
120	9.91	0.15	10.06	9.77
121	10.03	0.15	10.18	9.89
122	9.9	0.15	10.05	9.76
123	10.64	0.15	10.79	10.5
124	10.75	0.15	10.9	10.61
125	10.62	0.15	10.77	10.48
126	10.56	0.15	10.71	10.42
127	10.47	0.15	10.62	10.33
128	10.45	0.15	10.6	10.31
129	10.57	0.15	10.72	10.43
130	10.66	0.15	10.81	10.52
131	10.77	0.15	10.92	10.63
132	10.78	0.15	10.93	10.64
133	11.54	0.15	11.69	11.4
134	11.59	0.15	11.74	11.45
135	11.6	0.15	11.75	11.46
136	11.42	0.15	11.57	11.28
137	11.43	0.15	11.58	11.29
138	11.34	0.15	11.49	11.2
139	11.51	0.15	11.66	11.37
140	11.62	0.15	11.77	11.48
141	11.63	0.15	11.78	11.49
142	11.57	0.15	11.72	11.43
143	12.39	0.15	12.54	12.25
144	12.48	0.15	12.63	12.34
145	12.44	0.15	12.59	12.3
146	12.28	0.15	12.43	12.14
147	12.08	0.15	12.23	11.94
148	11.92	0.15	12.07	11.78
149	12.03	0.15	12.18	11.89
150	12.04	0.15	12.19	11.9
151	12.25	0.15	12.4	12.11
152	12.45	0.15	12.6	12.31
153	12.5	0.15	12.65	12.36
154	12.4	0.15	12.55	12.26
155	12.86	0.15	13.01	12.72
156	12.95	0.15	13.1	12.81
157	12.95	0.15	13.1	12.81
158	12.77	0.15	12.92	12.63
159	12.54	0.15	12.69	12.4
160	12.39	0.15	12.54	12.25

212	12.07	0.15	12.22	11.93
213	11.99	0.15	12.14	11.85
214	11.93	0.15	12.08	11.79
215	11.83	0.15	11.98	11.69
216	11.65	0.15	11.8	11.51
217	11.54	0.15	11.69	11.4
218	11.41	0.15	11.56	11.27
219	11.25	0.15	11.4	11.11
220	11.11	0.15	11.26	10.97
221	10.99	0.15	11.14	10.85
222	10.83	0.15	10.98	10.69
223	10.69	0.15	10.84	10.55
224	10.53	0.15	10.68	10.39
225	10.38	0.15	10.53	10.24
226	10.18	0.15	10.33	10.04
227	10.04	0.15	10.19	9.9
228	9.92	0.15	10.07	9.78
1001	10.49	0.15	10.64	10.35
1002	11.44	0.15	11.59	11.3
1003	12.33	0.15	12.48	12.19
1004	12.83	0.15	12.98	12.69
5000 / 1007	11.28	0.15	11.43	11.14

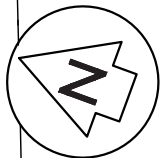


ARON KUMAR

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APPENDIX A – STORMWATER REPORT ASBUILT PLAN



- Notes
1. All works to be in accordance with Auckland council standards.
 2. Co-ordinates in terms of NZ Geodetic Datum Mt Eden 2000. Levels in terms of the Auckland Vertical Datum 1946.
 3. It is the contractors responsibility to locate all services that may be affected by his operations.

Legend

STAGE 1

STAGE 2

STAGE 3

STAGE 4

PR BOUNDARY

EX BOUNDARY

STAGING BOUNDARY

I	ADDED MFL IN NZVD 2016	ML	05/2025
H	STAGE 3 MFL REMOVED	ML	05/2025
G	STAGE 2 MFL UPDATE	ML	04/2025
F	LOT FGL UPDATE	ML	02/2025
Rev	Description	By	Date
		By	Date
Survey	-	-	-
Design	ML	11/2024	
Drawn	ML	11/2024	
Checked	JD	11/2024	

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M A E N

Maven Associates

09 571 0050

info@maven.co.nz

www.maven.co.nz

5 Owens Road, Epsom

Auckland 1023

Project

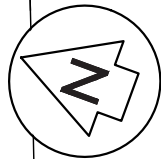
**62, 78 & 80 PAPA KURA -
CLEVEDON ROAD,
CLEVEDON, AUCKLAND
FOR CLEVEDON
PROPERTOES LTD**

Title

**BUN60399307 AS-BUILT
100-YEAR OLFP
STAGING PLAN**

Project no.	194006		
Scale	1:3500 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS		
Drawing no.	C462	Rev	I

ASBUILT



PR CATCHMENT A
AREA = 0.22ha
Q₁₀₀FLOW = 0.101m³/s

Q₁₀₀FLOW = 4.267m³/s

PR CATCHMENT B
AREA = 1.81ha
Q₁₀₀FLOW = 0.709m³/s

Q₁₀₀FLOW = 3.558m³/s

PR CATCHMENT D
AREA = 9.62ha
Q₁₀₀FLOW = 3.558m³/s

PR CATCHMENT E
AREA = 4.89ha
Q₁₀₀FLOW = 2.968m³/s

PR CATCHMENT F
AREA = 5.26ha
Q₁₀₀FLOW = 2.417m³/s

PR CATCHMENT G
AREA = 1.74ha
Q₁₀₀FLOW = 0.693m³/s

PR CATCHMENT H
AREA = 1.76ha
Q₁₀₀FLOW = 0.743m³/s

Q₁₀₀FLOW = 3.201m³/s

EX CATCHMENT B
AREA = 1.40ha
Q₁₀₀FLOW = 0.636m³/s

EX CATCHMENT C
AREA = 2.58ha
Q₁₀₀FLOW = 1.158m³/s

EX CATCHMENT D
AREA = 2.69ha
Q₁₀₀FLOW = 1.074m³/s

EX CATCHMENT E
AREA = 1.78ha
Q₁₀₀FLOW = 0.701m³/s

EX CATCHMENT F
AREA = 1.06ha
Q₁₀₀FLOW = 0.563m³/s

PR CATCHMENT C
AREA = 1.71ha
Q₁₀₀FLOW = 0.780m³/s

Notes

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Legend

- PR BOUNDARY
EX BOUNDARY
STAGING BOUNDARY
AB OLFP FLOW

I	ADDED MFL IN NZVD 2016	ML	05/2025
H	STAGE 3 MFL REMOVED	ML	05/2025
G	STAGE 2 MFL UPDATE	ML	04/2025
F	LOT FGL UPDATE	ML	02/2025
Rev	Description	By	Date
		By	Date
Survey	-	-	-
Design	ML	11/2024	
Drawn	ML	11/2024	
Checked	JD	11/2024	



Project
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Title
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100-YEAR OLFP
CATCHMENT PLAN**

Project no.	194006
Scale	1:3500 @ A3
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C463
Rev	I

ASBUILT

DATE: 5/9/25

ASBUILT



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Legend

- PR BOUNDARY
- EX BOUNDARY
- STAGING BOUNDARY
- AB OLFP FLOW
- AB OLFP SHEET FLOW
- AB MAJOR CONTOUR
- AB MINOR CONTOUR

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Maven Associates

09 571 0050

info@maven.co.nz

www.maven.co.nz

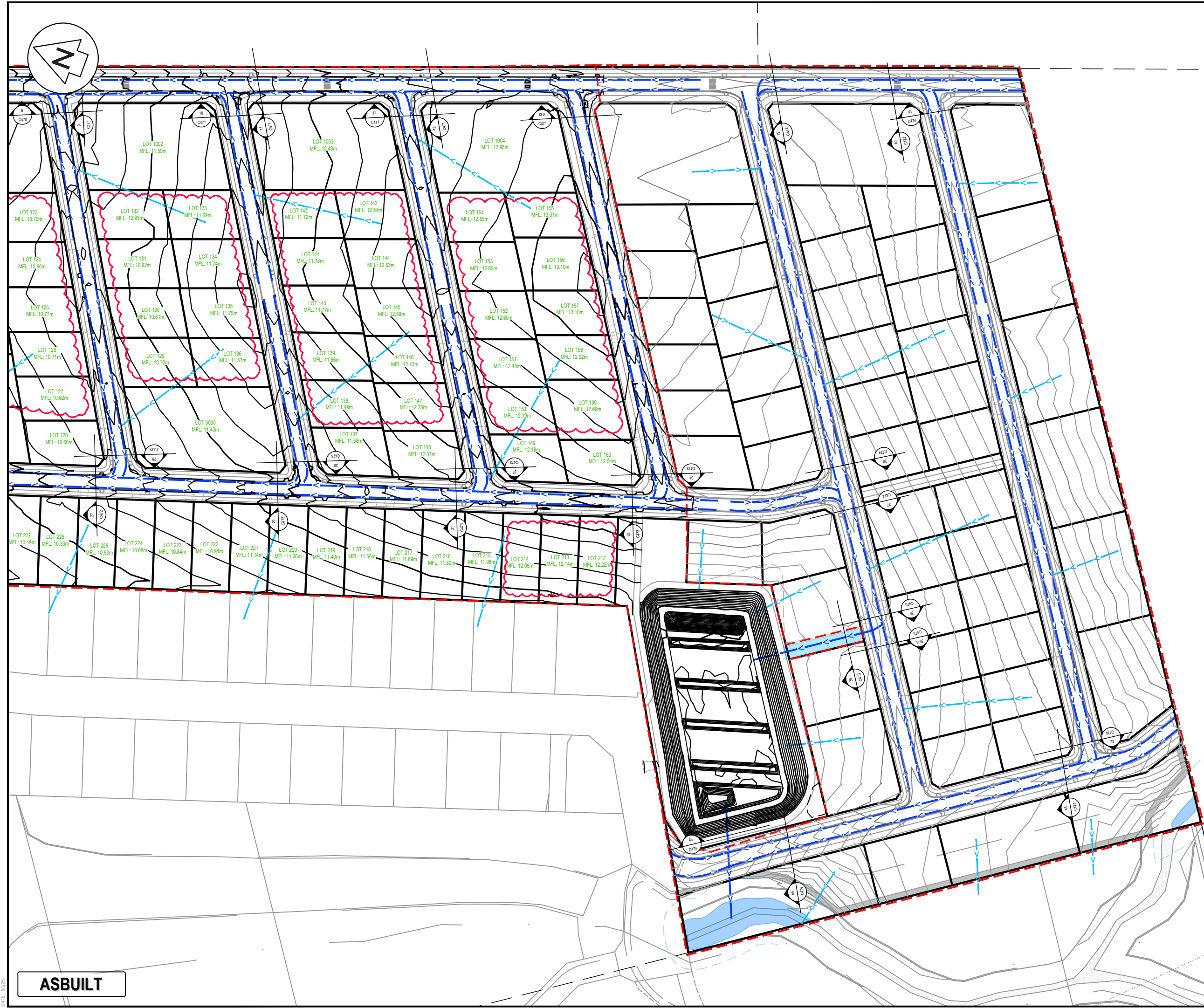
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FOR CLEVEDON
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Title
**BUN60399307 AS-BUILT
100-YEAR OLFP
PLAN**

Project no.	194006
Scale	1:1750 @ A3
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C464
Rev	I



- Notes
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Legend

	PR BOUNDARY
	EX BOUNDARY
	STAGING BOUNDARY
	AB OLFP FLOW
	AB OLFP SHEET FLOW
	AB MAJOR CONTOUR
	AB MINOR CONTOUR
	PR MAJOR CONTOUR (STG 3)
	PR MINOR CONTOUR (STG 3)

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09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
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Drawing no.	C465
Rev	I

ASBUILT



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Legend

- PR BOUNDARY
- EX BOUNDARY
- STAGING BOUNDARY
- AB MAJOR CONTOUR
- AB MINOR CONTOUR
- 100-YR FLOOD EXTENT

I	ADDED MFL IN NZVD 2016	ML	05/2025
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Maven Associates

09 571 0050

info@maven.co.nz

www.maven.co.nz

5 Owens Road, Epsom

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100-YEAR FLOOD EXTENT
PLAN**

Project no.	194006
Scale	1:1750 @ A3
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C466
Rev	I



- Notes
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Legend	
	PR BOUNDARY
	EX BOUNDARY
	STAGING BOUNDARY
	AB MAJOR CONTOUR
	AB MINOR CONTOUR
	100 YR FLOOD EXTENT
	PR MAJOR CONTOUR (STG 3)
	PR MINOR CONTOUR (STG 3)

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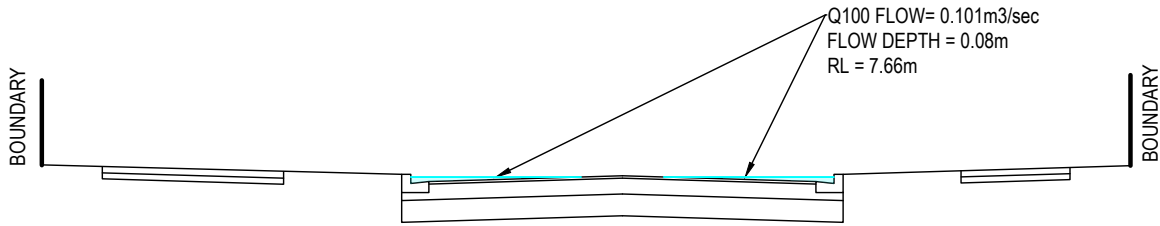


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09 571 0050
info@maven.co.nz
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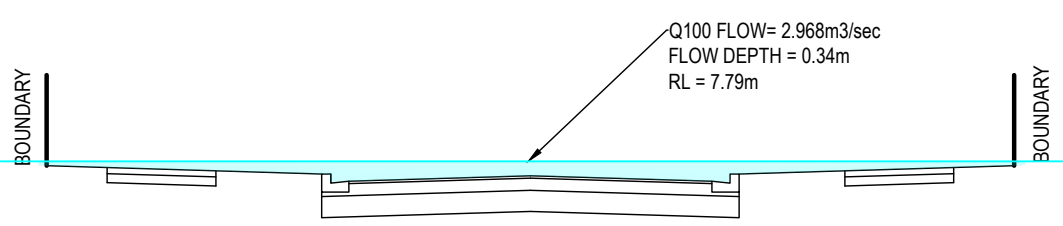
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100-YEAR FLOOD EXTENT
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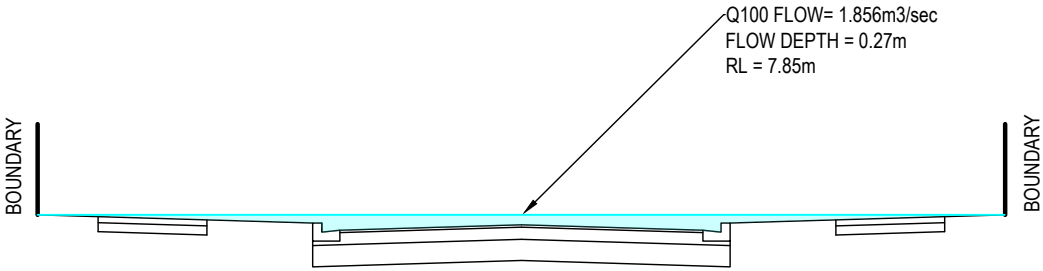
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Drawing no.	C467	Rev	I



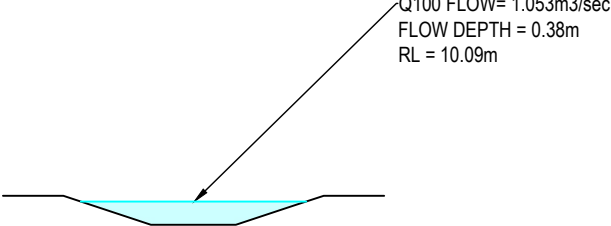
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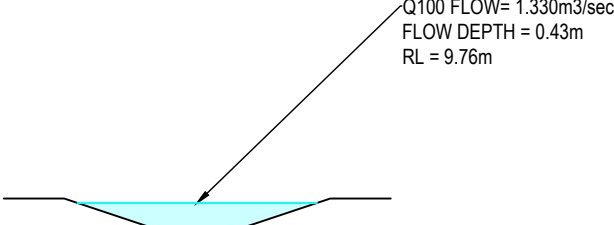
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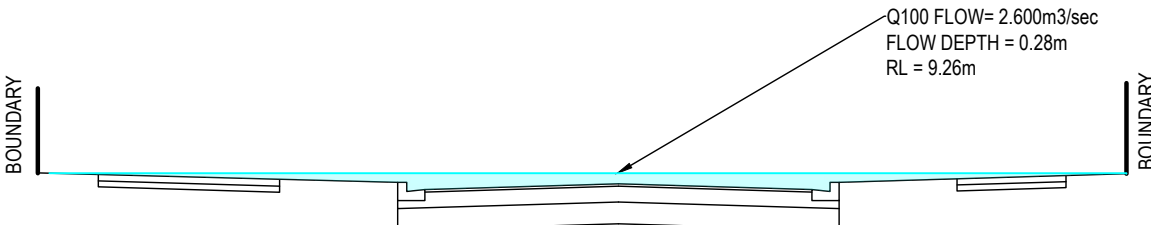
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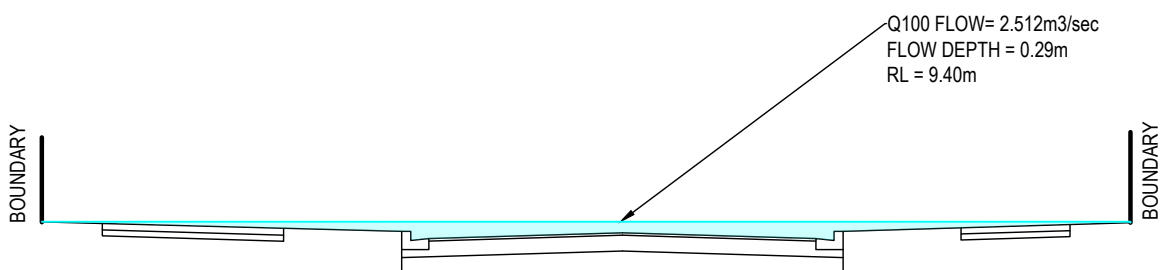
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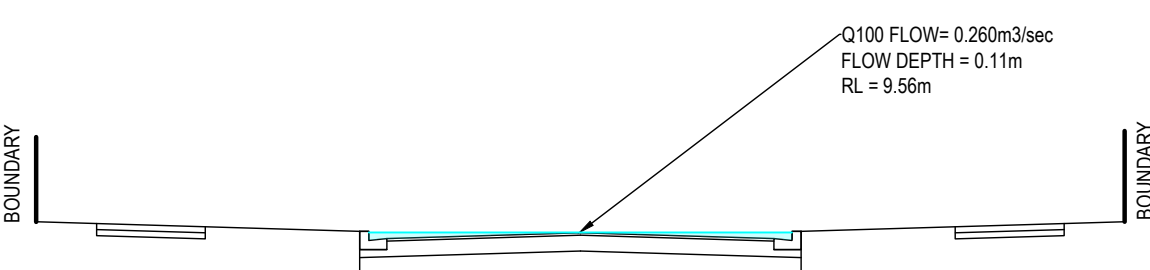
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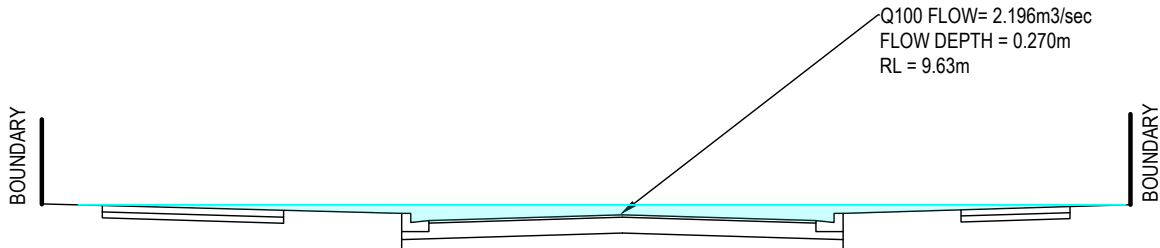
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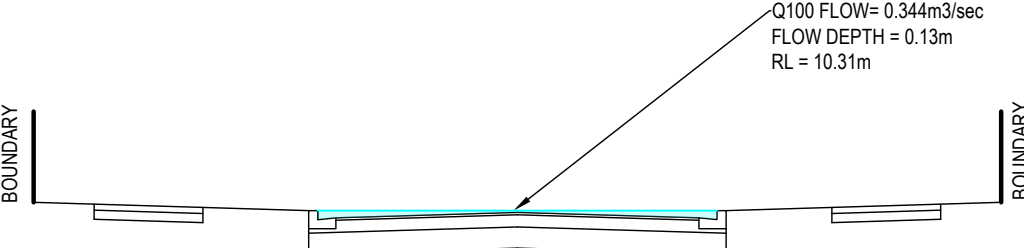
SECTION 5 - ROAD 1



SECTION 6 - ROAD 6



SECTION 7 - ROAD 1



SECTION 8 - ROAD 7

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100-YR FLOOD EXTENT

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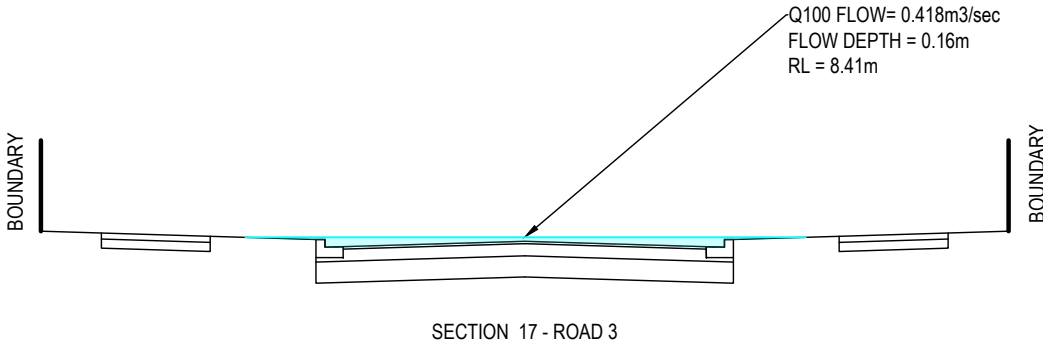
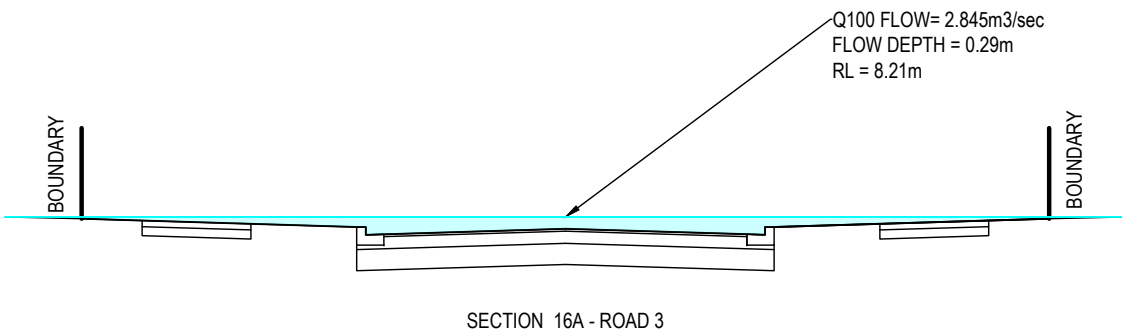
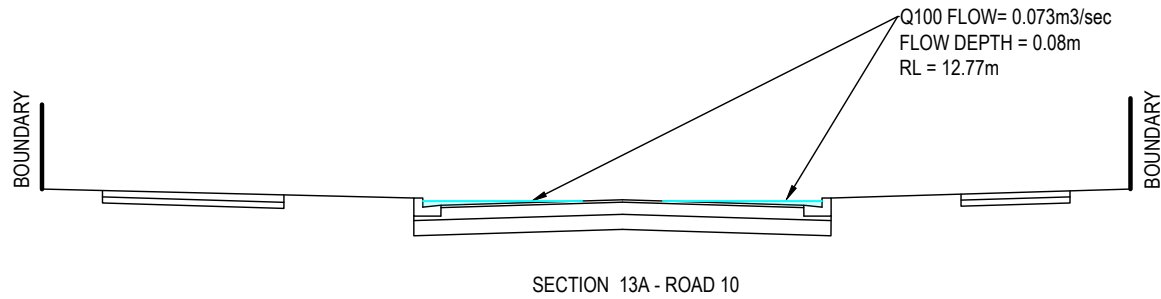
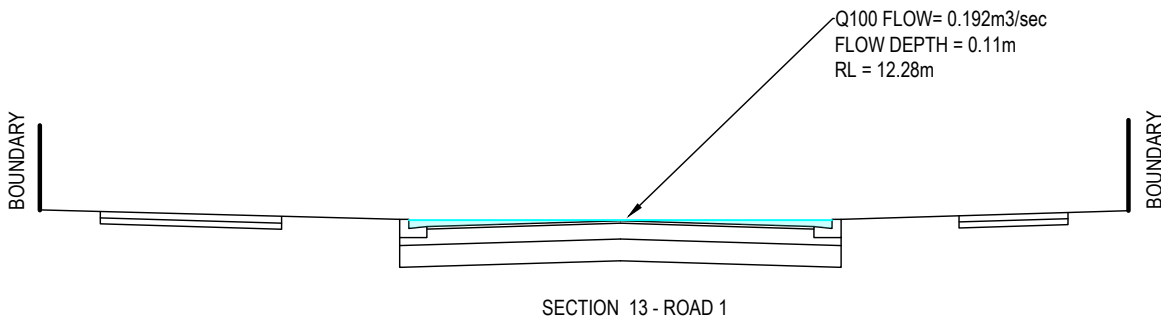
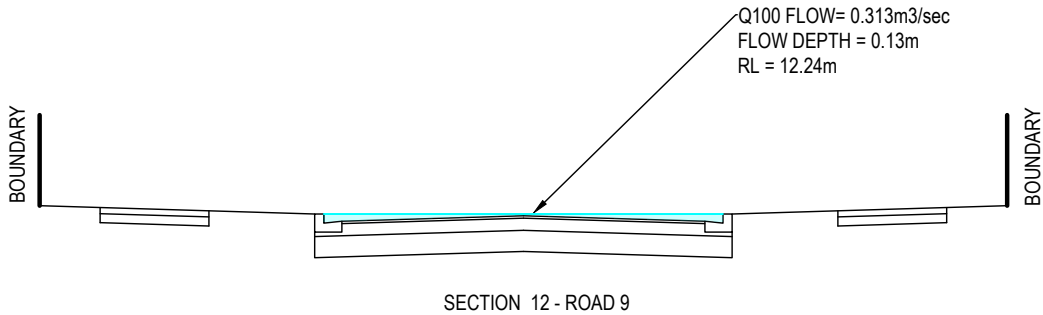
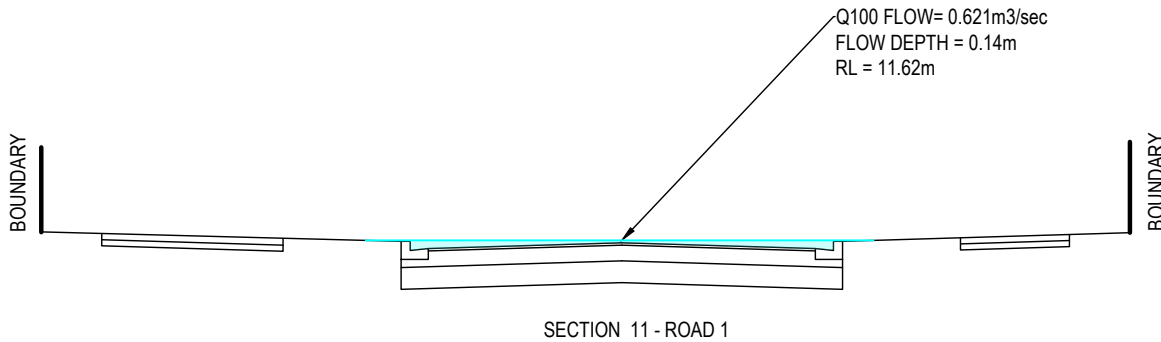
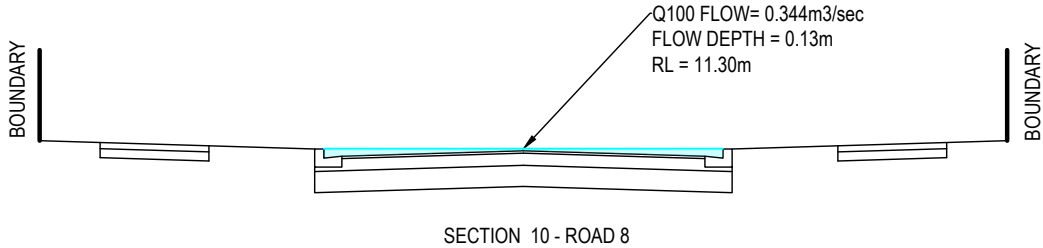
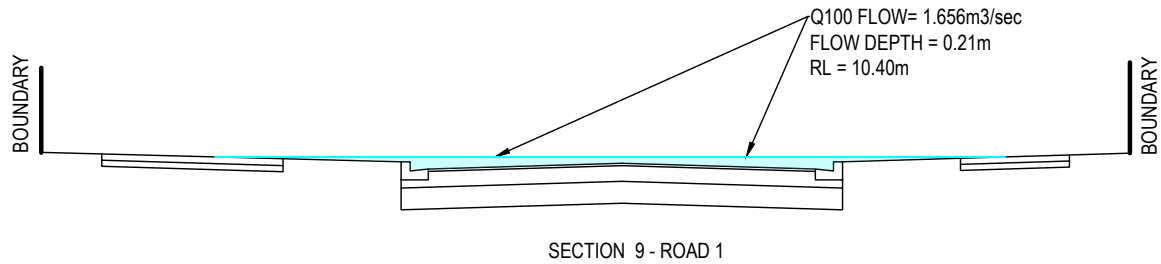
**62, 78 & 80 PAPAURA -
CLEVEDON ROAD,
CLEVEDON, AUCKLAND
FOR CLEVEDON
PROPERTOES LTD**

Title

**BUN60399307 AS-BUILT
100-YEAR OLF
SECTIONS**

Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS		
Drawing no.	C470	Rev	I

ASBUILT



- Notes
1. All works to be in accordance with Auckland council standards.
 2. Co-ordinates in terms of NZ Geodetic Datum Mt Eden 2000. Levels in terms of the Auckland Vertical Datum 1946.
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Legend

100-YR FLOOD EXTENT

I	ADDED MFL IN NZVD 2016	ML	05/2025
H	STAGE 3 MFL REMOVED	ML	05/2025
G	STAGE 2 MFL UPDATE	ML	04/2025
F	LOT FGL UPDATE	ML	02/2025
Rev	Description	By	Date
		By	Date
Survey	-	-	-
Design	ML	11/2024	
Drawn	ML	11/2024	
Checked	JD	11/2024	

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Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

Project

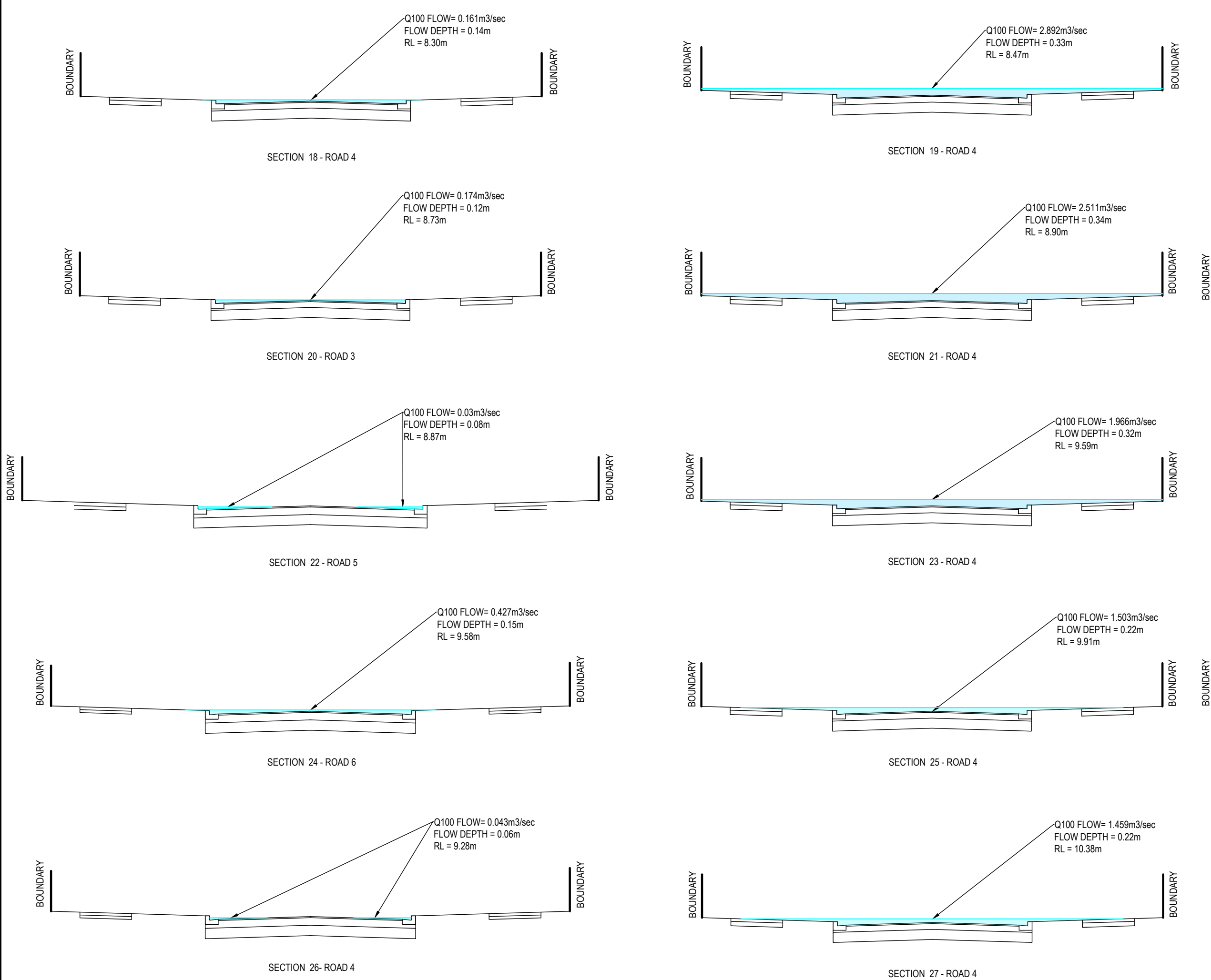
**62, 78 & 80 PAPA KURA -
CLEVEDON ROAD,
CLEVEDON, AUCKLAND
FOR CLEVEDON
PROPERTOES LTD**

Title

**BUN60399307 AS-BUILT
FLOOD ASSESSMENT
PLAN**

Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS		
Drawing no.	C471	Rev	I

ASBUILT



ASBUILT

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Legend

100-YR FLOOD EXTENT

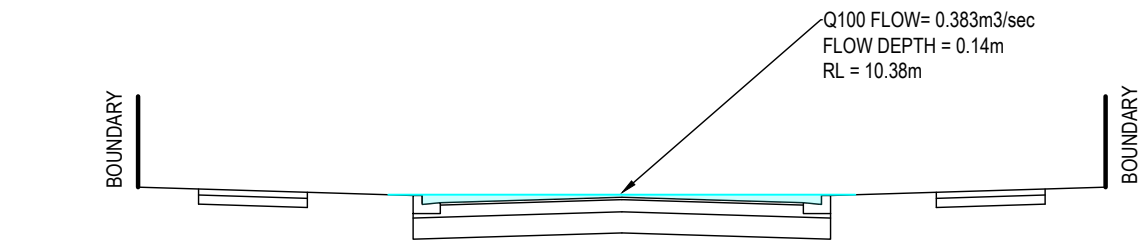
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H	STAGE 3 MFL REMOVED	ML	05/2025
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09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

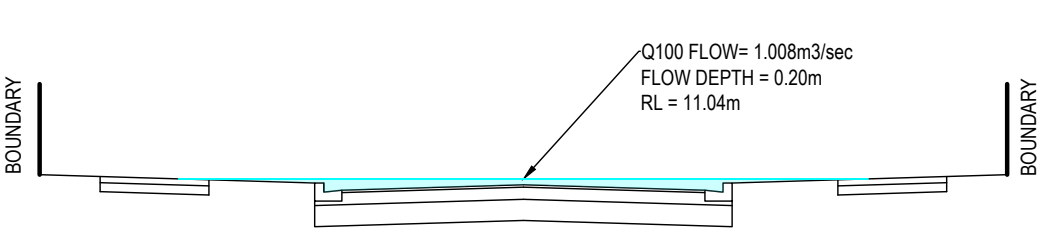
Project
**62, 78 & 80 PAPAURA -
CLEVEDON ROAD,
CLEVEDON, AUCKLAND
FOR CLEVEDON
PROPERTOES LTD**

Title
**BUN60399307 AS-BUILT
FLOOD ASSESSMENT
PLAN**

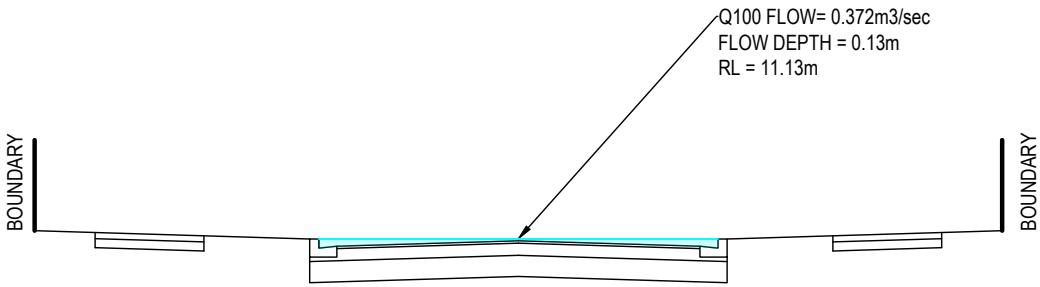
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Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-		
Drawing no.	C472	Rev	I



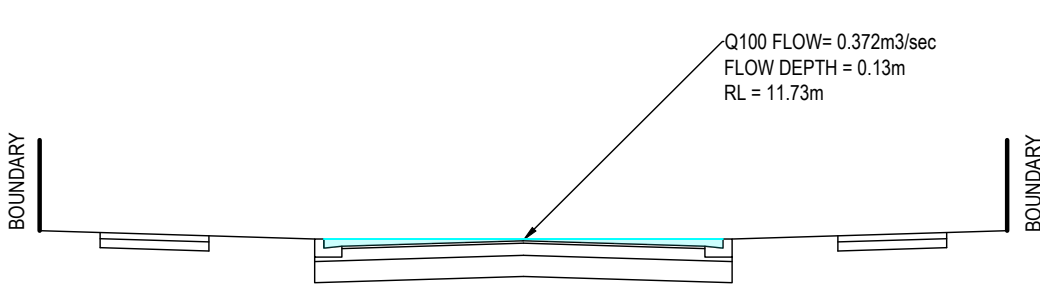
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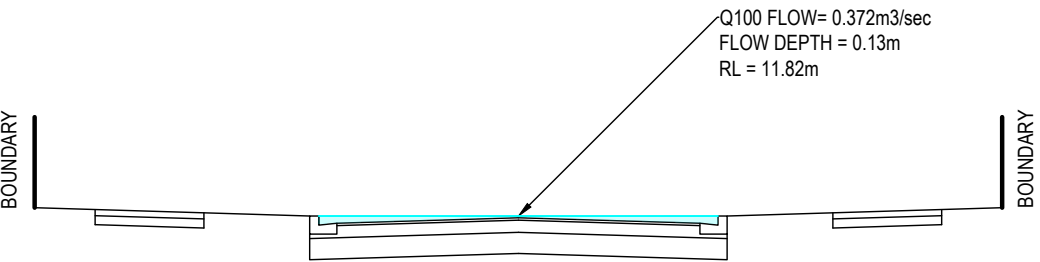
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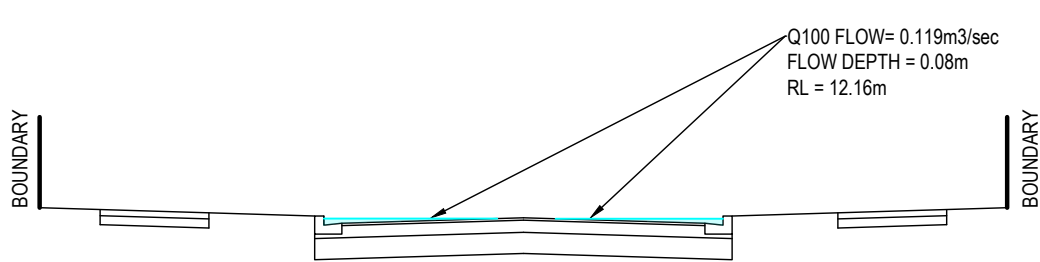
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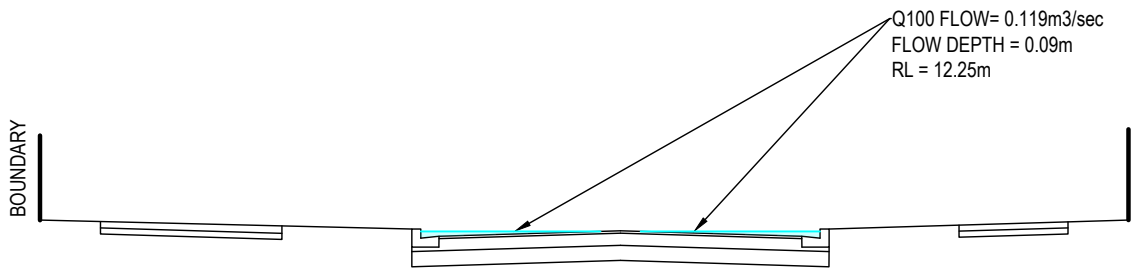
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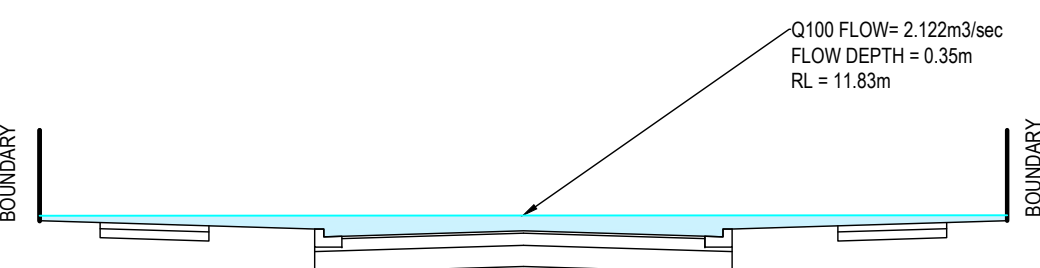
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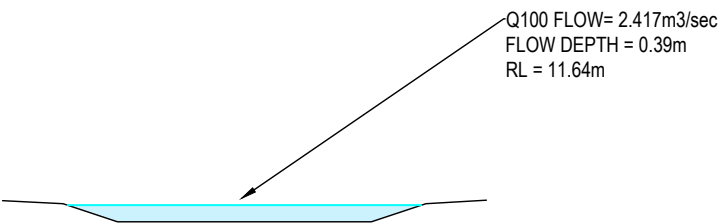
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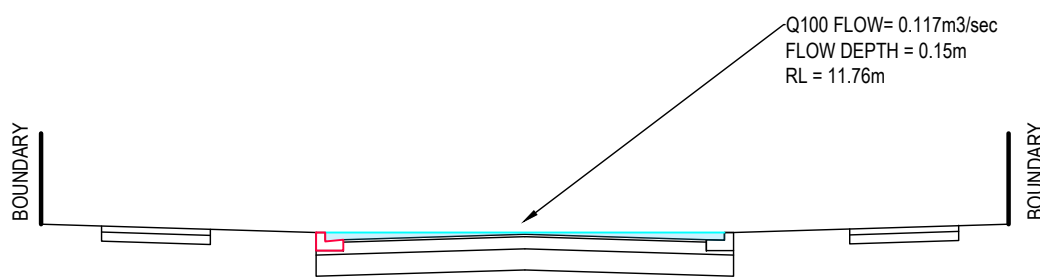
SECTION 34 - ROAD 10



SECTION 35 - ROAD 11



SECTION 36 - SWALE



SECTION 36A - ROAD 11

- Notes
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Legend

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F	LOT FGL UPDATE	ML	02/2025
Rev	Description	By	Date
		By	Date
Survey	-	-	-
Design	ML	11/2024	
Drawn	ML	11/2024	
Checked	JD	11/2024	

M

M A E N

Maven Associates

09 571 0050

info@maven.co.nz

www.maven.co.nz

5 Owens Road, Epsom

Auckland 1023

Project

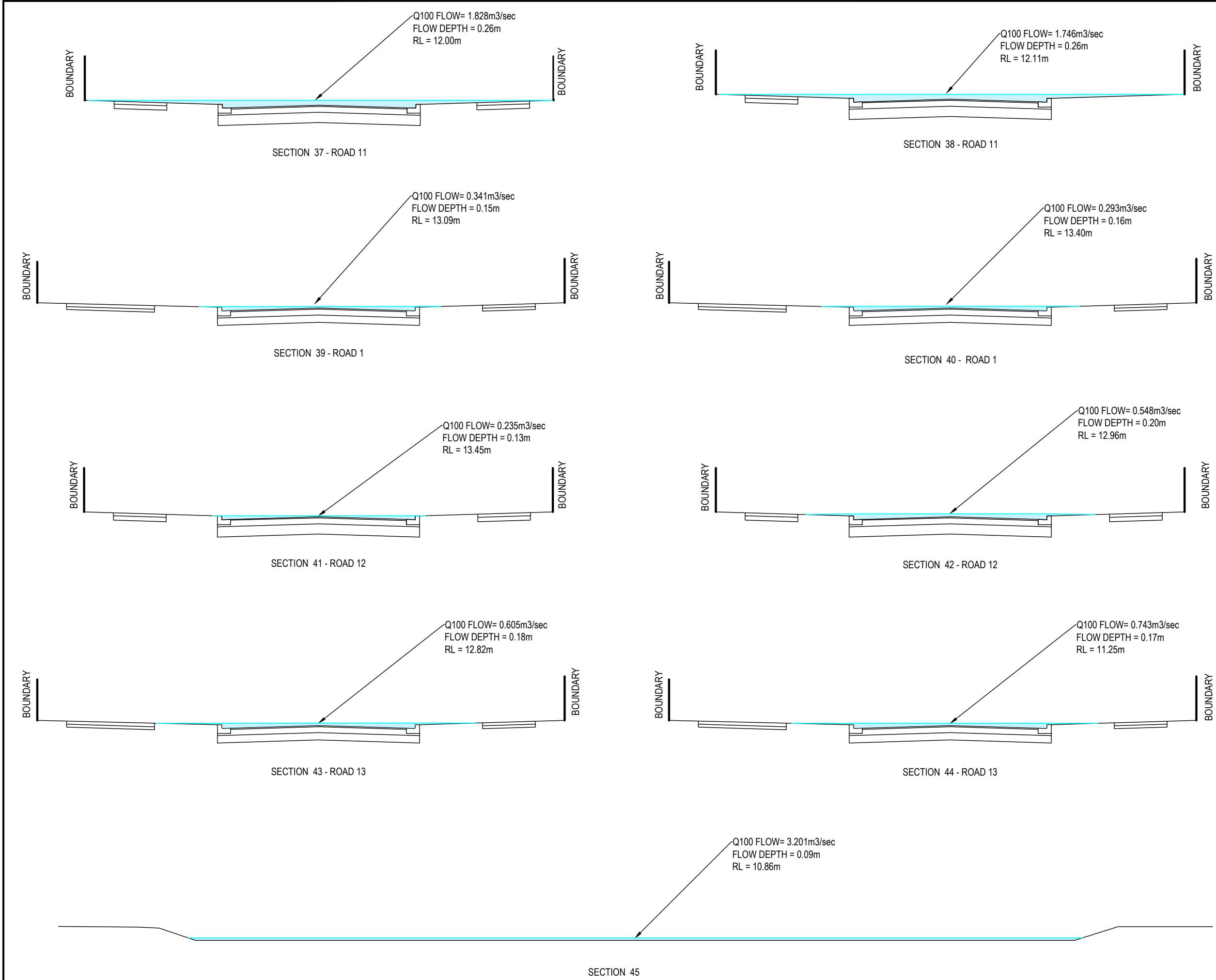
62, 78 & 80 PAPAURA - CLEVEDON ROAD, CLEVEDON, AUCKLAND FOR CLEVEDON PROPERTOES LTD

Title

BUN60399307 AS-BUILT 100-YEAR OLFPP SECTIONS

Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS		
Drawing no.	C473	Rev	I

ASBUILT



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- Notes
1. All works to be in accordance with Auckland council standards.
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Legend

100-YR FLOOD EXTENT

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Rev	Description	By	Date
		By	Date
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Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

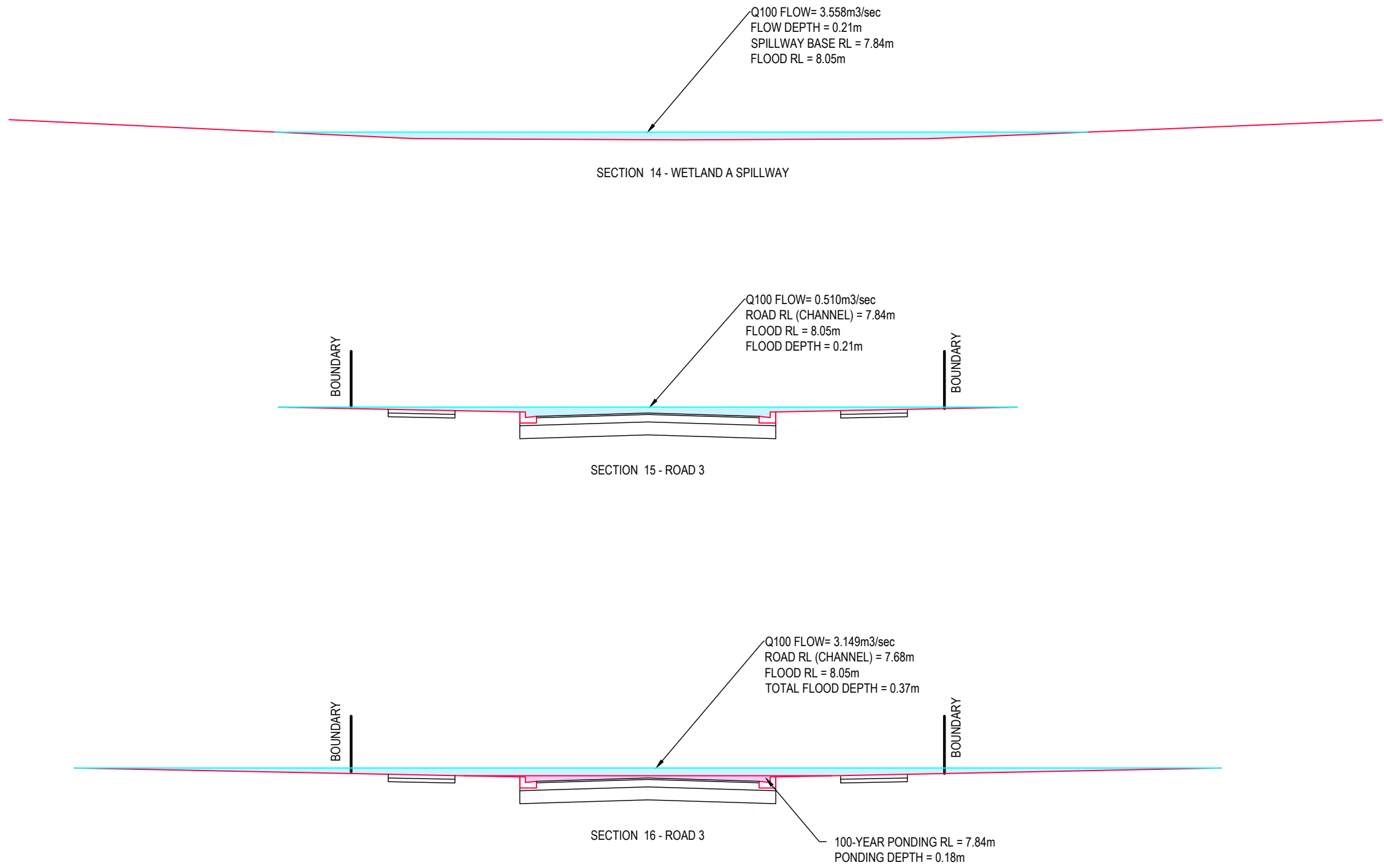
Project

**62, 78 & 80 PAPAURA -
CLEVEDON ROAD,
CLEVEDON, AUCKLAND
FOR CLEVEDON
PROPERTOES LTD**

Title

**BUN60399307 AS-BUILT
100-YEAR OLFP
SECTIONS**

Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-		
Drawing no.	C474	Rev	I



- Notes
1. All works to be in accordance with Auckland council standards.
 2. Co-ordinates in terms of NZ Geodetic Datum Mt Eden 2000. Levels in terms of the Auckland Vertical Datum 1946.
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Legend

100-YR FLOOD EXTENT

I	ADDED MFL IN NZVD 2016	ML	05/2025
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F	LOT FGL UPDATE	ML	02/2025
Rev	Description	By	Date
	By	Date	
Survey	-	-	
Design	ML	11/2024	
Drawn	ML	11/2024	
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N

Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

Project

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FOR CLEVEDON
PROPERTOES LTD**

Title

**BUN60399307 AS-BUILT
100-YEAR OLF
SECTIONS**

Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS		
Drawing no.	C475	Rev	I

ASBUILT

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Stage 1				
Lot	Final Flood Level	Freeboard Required	Auckland Vertical Datum 1946 MFL (m)	NZVD 2016 Datum MFL (m)
1	8.18	0.50	8.68	8.39
2	8.31	0.50	8.81	8.52
3	8.43	0.50	8.93	8.64
4	8.55	0.50	9.05	8.76
5	8.60	0.50	9.10	8.81
6	8.71	0.50	9.21	8.92
7	8.81	0.50	9.31	9.02
8	8.90	0.50	9.40	9.11
9	9.04	0.50	9.54	9.25
10	9.11	0.50	9.61	9.32
11	9.22	0.50	9.72	9.43
12	9.59	0.15	9.74	9.45
13	9.51	0.15	9.66	9.37
14	9.41	0.15	9.56	9.27
15	9.16	0.15	9.31	9.02
16	8.91	0.15	9.06	8.77
17	8.68	0.15	8.83	8.54
18	8.46	0.15	8.61	8.32
19	8.22	0.15	8.37	8.08
20	8.06	0.15	8.35	8.06
21	7.91	0.15	8.35	8.06
22	8.26	0.50	8.76	8.47
23	8.33	0.50	8.83	8.54
24	8.81	0.15	8.96	8.67
25	9.07	0.15	9.22	8.93
26	9.24	0.15	9.39	9.10
27	9.33	0.15	9.48	9.19
28	9.44	0.15	9.59	9.30
29	9.86	0.50	10.36	10.07
30	9.86	0.50	10.36	10.07
31	10.09	0.50	10.59	10.30
32	9.73	0.15	9.88	9.59
33	9.73	0.15	9.88	9.59
34	9.52	0.50	10.02	9.73
35	9.40	0.50	9.90	9.61
36	9.64	0.15	9.79	9.50
37	9.80	0.15	9.95	9.66
38	9.05	0.15	9.20	8.91
39	9.29	0.50	9.79	9.50
40	9.20	0.50	9.70	9.41
41	9.10	0.50	9.60	9.31
42	9.01	0.50	9.51	9.22
43	8.89	0.50	9.39	9.10
44	8.40	0.15	8.55	8.26
45	8.41	0.15	8.56	8.27
46	8.52	0.15	8.67	8.38
47	8.65	0.15	8.80	8.51
48	8.77	0.15	8.92	8.63
49	8.86	0.15	9.01	8.72
50	9.15	0.15	9.30	9.01
51	9.96	0.15	10.11	9.82
52	8.84	0.15	8.99	8.70
53	8.76	0.15	8.91	8.62
54	8.64	0.15	8.79	8.50
55	9.55	0.15	9.70	9.41
56	9.85	0.15	10.00	9.71
57	9.78	0.15	9.93	9.64
58	9.61	0.50	10.11	9.82
59	9.50	0.50	10.00	9.71
60	9.42	0.50	9.92	9.63
61	9.30	0.50	9.80	9.51
62	9.18	0.50	9.68	9.39
63	8.90	0.50	9.40	9.11
64	8.85	0.50	9.35	9.06
65	8.71	0.50	9.21	8.92
66	8.65	0.50	9.15	8.86
67	8.54	0.50	9.04	8.75
68	8.79	0.50	9.29	9.00
69	8.66	0.50	9.16	8.87
70	8.55	0.50	9.05	8.76
71	8.48	0.50	8.98	8.69
72	8.18	0.50	8.68	8.39
73	8.10	0.50	8.60	8.31
74	8.05	0.50	8.55	8.26
75	8.05	0.50	8.55	8.26
76	8.05	0.50	8.55	8.26
77	8.05	0.50	8.55	8.26
78	8.05	0.50	8.55	8.26
79	8.05	0.50	8.55	8.26
80	8.36	0.15	8.51	8.22
81	8.42	0.15	8.57	8.28
82	8.52	0.15	8.67	8.38
83	8.78	0.15	8.93	8.64
84	8.29	0.15	8.44	8.15
85	8.45	0.15	8.60	8.31
86	8.58	0.15	8.73	8.44
87	8.60	0.50	9.10	8.81
89	8.60	0.50	9.10	8.81
90	8.60	0.50	9.10	8.81

Stage 1				
Lot	Final Flood Level	Freeboard Required	Auckland Vertical Datum 1946 MFL (m)	NZVD 2016 Datum MFL (m)
91	8.60	0.50	9.10	8.81
92	8.99	0.15	9.14	8.85
93	9.07	0.15	9.22	8.93
94	8.93	0.15	9.08	8.79
95	9.04	0.15	9.19	8.90
96	9.12	0.15	9.27	8.98
97	9.21	0.15	9.36	9.07
98	9.23	0.15	9.38	9.09
99	9.18	0.15	9.33	9.04
100	9.09	0.15	9.24	8.95
101	9.01	0.15	9.16	8.87
102	9.23	0.15	9.38	9.09
103	9.15	0.15	9.30	9.01
104	9.05	0.15	9.20	8.91
105	8.93	0.15	9.08	8.79
106	8.97	0.50	9.47	9.18
107	9.06	0.50	9.56	9.27
108	9.06	0.50	9.56	9.27
109	9.19	0.50	9.69	9.40
110	9.20	0.50	9.70	9.41
111	9.30	0.50	9.80	9.51
112	9.35	0.50	9.85	9.56
113	9.35	0.50	9.85	9.56
114	9.45	0.50	9.95	9.66
115	9.54	0.50	10.04	9.75
116	9.39	0.15	9.54	9.25
117	9.59	0.50	10.09	9.80
229	9.46	0.15	9.61	9.32

Stage 2				
Lot	Final Flood Level	Freeboard Required	Auckland Vertical Datum 1946 MFL (m)	NZVD 2016 Datum MFL (m)
118	9.97	0.15	10.12	9.83
119	9.79	0.15	9.94	9.65
120	9.91	0.15	10.06	9.77
121	10.03	0.15	10.18	9.89
122	9.90	0.15	10.05	9.76
123	10.64	0.15	10.79	10.50
124	10.75	0.15	10.90	10.61
125	10.62	0.15	10.77	10.48
126	10.56	0.15	10.71	10.42
127	10.47	0.15	10.62	10.33
128	10.45	0.15	10.60	10.31
129	10.57	0.15	10.72	10.43
130	10.66	0.15	10.81	10.52
131	10.77	0.15	10.92	10.63
132	10.78	0.15	10.93	10.64
133	11.54	0.15	11.69	11.40
134	11.59	0.15	11.74	11.45
135	11.60	0.15	11.75	11.46
136	11.42	0.15	11.57	11.28
137	11.43	0.15	11.58	11.29
138	11.34	0.15	11.49	11.20
139	11.51	0.15	11.66	11.37
140	11.62	0.15	11.77	11.48
141	11.63	0.15	11.78	11.49
142	11.57	0.15	11.72	11.43
143	12.39	0.15	12.54	12.25
144	12.48	0.15	12.63	12.34
145	12.44	0.15	12.59	12.30
146	12.28	0.15	12.43	12.14
147	12.08	0.15	12.23	11.94
148	11.92	0.15	12.07	11.78
149	12.03	0.15	12.18	11.89
150	12.04	0.15	12.19	11.90
151	12.25	0.15	12.40	12.11
152	12.45	0.15	12.60	12.31
153	12.50	0.15	12.65	12.36
154	12.40	0.15	12.55	12.26
155	12.86	0.15	13.01	12.72
156	12.95	0.15	13.10	12.81
157	12.95	0.15	13.10	12.81
158	12.77	0.15	12.92	12.63
159	12.54	0.15	12.69	12.40
160	12.39	0.15	12.54	12.25
212	12.07	0.15	12.22	11.93
213	11.99	0.15	12.14	11.85
214	11.93	0.15	12.08	11.79
215	11.83	0.15	11.98	11.69
216	11.65	0.15	11.80	11.51
217	11.54	0.15	11.69	11.40
218	11.41	0.15	11.56	11.27
219	11.25	0.15	11.40	11.11
220	11.11	0.15	11.26	10.97
221	10.99	0.15	11.14	10.85
222	10.83	0.15	10.98	10.69
223	10.69	0.15	10.84	10.55
224	10.53	0.15	10.68	10.39
225	10.38	0.15	10.53	10.24
226	10.18	0.15	10.33	10.04
227	10.04	0.15	10.19	9.90
228	9.92	0.15	10.07	9.78
1001	10.49	0.15	10.64	10.35
1002	11.44	0.15	11.59	11.30
1003	12.33	0.15	12.48	12.19
1004	12.83	0.15	12.98	12.69
5000 / 1007	11.28	0.15	11.43	11.14

Key: Blue = Deviation from Approved SMP

Notes

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Rev	Description		By	Date
	By	Date		
Survey	-		-	
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M M A E N Maven Associates 09 571 0050 info@maven.co.nz www.maven.co.nz 5 Owens Road, Epsom Auckland 1023				
Project				
62, 78 & 80 PAPA KURA - CLEVEDON ROAD, CLEVEDON, AUCKLAND FOR CLEVEDON PROPERTOES LTD				
Title				
BUN60399307 AS-BUILT MINIMUM FLOOR LEVEL TABLE				
Project no.		194006		
Scale		N/A		
Cad file		BUN60399307 - OVERLAND FLOW PATH AS-		
Drawing no.		C480	Rev	I

APPENDIX B – OVERLAND FLOWPATH TP108 CALCULATIONS

 MAVEN ASSOCIATES	Job Number 194006	Sheet 1	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment A	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.24	112.59
C	Proposed Roads	94.4	0.00	0.00
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.240 112.59

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{112.59}{1.240} = 90.8$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.3720}{1.240} = 1.5 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.195 km (along drainage path)

Catchment Slope Sc= 0.182 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{90.8}{200 - 90.8} = 0.83$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.34 1.11 1.67 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.04 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 2	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment A	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.0124 km ² (100ha =1km ²)		
Runoff curve number	CN=	90.8 (from worksheet 1)		
Initial abstraction	Ia=	1.5 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	25.7 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$				

100 (yr)
280.32 (mm)
0.84
0.162
0.563 m ³ /s 0.268 (GIS)
255.3
3165.21 (m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 3	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment B	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.40	127.12
C	Proposed Roads	94.4	0.00	0.00
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.400 127.12

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{127.12}{1.400} = 90.8$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.4200}{1.400} = 1.5 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.174 km (along drainage path)

Catchment Slope Sc= 0.12 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{90.8}{200 - 90.8} = 0.83$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14
0.6
0.32
1.11
1.89
= 0.06 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.04 hrs

NO GOOD

use

0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 4	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment B	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.014 km2(100ha =1km2)		
Runoff curve number	CN=	90.8 (from worksheet 1)		
Initial abstraction	la=	1.5 mm (from worksheet 1)		
Time of concentration	tc=	#REF! hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	25.7 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.84		
6. Specific peak flow rate q^*		0.162		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.636	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		255.3		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		3573.63	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 5	Rev A
Job Title Calc Title Clevedon Meadows TP108 Calculation EX Catchment C	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	2.25	204.30
C	Pervious Area	74	0.33	24.49
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	2.581 228.79

CN (weighted) = $\frac{\text{total product} = 228.79}{\text{total area} = 2.581} = 88.6$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 1.0060}{\text{total area} = 2.581} = 1.9 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.185 km (along drainage path)

Catchment Slope Sc= 0.19 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{88.6}{200 - 88.6} = 0.80$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.33 1.13 1.65 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 6	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment C	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.02581	km ² (100ha =1km ²)	
Runoff curve number	CN=	88.6	(from worksheet 1)	
Initial abstraction	Ia=	1.9	mm (from worksheet 1)	
Time of concentration	tc=	#REF!	hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		32.5	mm
3. Average recurrence interval, ARI			100	(yr)
4. 24 hour rainfall depth, P ₂₄			280.32	(mm)
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$			0.81	
6. Specific peak flow rate q^*			0.160	
7. Peak flow rate, $q_p = q^* A P_{24}$			1.158	m ³ /s 0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$			249.2	
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$			6432.91	(m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 7	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment D	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.16	14.16
C	Pervious Area	74	2.54	187.74
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	2.693 201.90

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{201.90}{2.693} = 75.0$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.5838}{2.693} = 4.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.197 km (along drainage path)

Catchment Slope Sc= 0.098 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{75.0}{200 - 75.0} = 0.60$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.34 1.32 2.01 = 0.08 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.05 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 8	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment D	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.02693 km2(100ha =1km2)		
Runoff curve number	CN=	75.0 (from worksheet 1)		
Initial abstraction	la=	4.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	84.8 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.61		
6. Specific peak flow rate q^*		0.141		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		1.067	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		210.7		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		5673.80	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 9	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment E	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Pervious Area	74	1.78	131.50
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.777 131.50

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{131.50}{1.777} = 74.0$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0000}{1.777} = 0.0 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.219 km (along drainage path)

Catchment Slope Sc= 0.098 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{74.0}{200 - 74.0} = 0.59$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14	0.6	0.37	1.34	2.01	= <u>0.08</u> hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 10	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment E	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.01777 km ² (100ha =1km ²)		
Runoff curve number	CN=	74.0 (from worksheet 1)		
Initial abstraction	Ia=	0.0 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	89.2 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$				

100 (yr)
280.32 (mm)
0.61
0.141
0.701 m ³ /s 0.268 (GIS)
212.6
3778.39 (m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 11	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment F	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.08	97.72
C	Pervious Area	74	0.00	0.00
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.076 97.72

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{97.72}{1.076} = 90.8$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.3229}{1.076} = 1.5 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.241 km (along drainage path)

Catchment Slope Sc = 0.63 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{90.8}{200 - 90.8} = 0.83$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.39 1.11 1.15 = 0.04 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 12	Rev A
Job Title Calc Title	Clevedon Meadows TP108 Calculation EX Catchment F	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.010762 km ² (100ha =1km ²)		
Runoff curve number	CN=	90.8 (from worksheet 1)		
Initial abstraction	Ia=	1.5 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	25.7 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.84		
6. Specific peak flow rate q^*		0.162		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.489	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		255.3		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		2747.10	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 1	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 1	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.22	19.99
C	Proposed Roads	94.4	0.00	0.00
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.220 19.99

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{19.99}{0.220} = 90.8$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0660}{0.220} = 1.5 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.1 km (along drainage path)

Catchment Slope Sc= 0.21 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{90.8}{200 - 90.8} = 0.83$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.22 1.11 1.60 = 0.03 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.02 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 2	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 1	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A=

0.002201 km2(100ha =1km2)

Runoff curve number

CN=

90.8 (from worksheet 1)

Initial abstraction

la=

1.5 mm (from worksheet 1)

Time of concentration

tc=

0.17 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

=

25.7 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

282.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.84

6. Specific peak flow rate q^*

0.162

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

0.101 m3/s

0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

257.2

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

566.20 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 3	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 2	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	2.81	255.14
C	Proposed Roads	94.4	2.08	196.38
C	Existing Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	583.02

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{583.02}{6.667} = 87.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.9320}{6.667} = 2.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.712 km (along drainage path)

Catchment Slope Sc = 0.076 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{87.4}{200 - 87.4} = 0.78$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

=	0.14	0.6	0.80	1.15	2.17	=	0.17 hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.11 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 4	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 2	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.066672 km ² (100ha =1km ²)		
Runoff curve number	CN=	87.4 (from worksheet 1)		
Initial abstraction	Ia=	2.2 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	36.5 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.79		
6. Specific peak flow rate q^*		0.159		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		2.968 m ³ /s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		245.9		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		16393.44 (m ³)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 5	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 3	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.29	117.13
C	Proposed Roads	94.4	0.42	39.65
C	Existing Lots	74	2.69	199.06
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	4.400 355.84

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{355.84}{4.400} = 80.9$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 3.1400}{4.400} = 3.6 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.52 km (along drainage path)

Catchment Slope Sc = 0.083 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{80.9}{200 - 80.9} = 0.68$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.65 1.24 2.11 = 0.14 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.10 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 6	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 3	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.044 km ² (100ha =1km ²)		
Runoff curve number	CN=	80.9 (from worksheet 1)		
Initial abstraction	Ia=	3.6 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	60.1 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$		0.69		
6. Specific peak flow rate q^*		0.150		
7. Peak flow rate, $q_p = q^* A P_{24}$		1.856	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		227.4		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		10005.27	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 7	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 3A	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.00	0.00
C	Existing Lots	74	2.69	199.06
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	2.690 199.06

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{199.06}{2.690} = 74.0$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.6900}{2.690} = 5.0 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.2 km (along drainage path)

Catchment Slope Sc= 0.083 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{74.0}{200 - 74.0} = 0.59$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.35 1.34 2.11 = 0.08 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 8	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 3A	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.0269 km ² (100ha =1km ²)		
Runoff curve number	CN=	74.0 (from worksheet 1)		
Initial abstraction	Ia=	5.0 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	89.2 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$				

100 (yr)
280.32 (mm)
0.60
0.140
1.053 m ³ /s 0.268 (GIS)
207.9
5593.13 (m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 9	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 3B	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.59	53.57
C	Proposed Roads	94.4	0.00	0.00
C	Existing Lots	74	2.69	199.06
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	3.280 252.63

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{252.63}{3.280} = 77.0$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.8670}{3.280} = 4.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.29 km (along drainage path)

Catchment Slope Sc = 0.08 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{77.0}{200 - 77.0} = 0.63$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.44 1.29 2.13 = 0.10 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.07 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 10	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment S3B	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.0328 km ² (100ha =1km ²)		
Runoff curve number	CN=	77.0 (from worksheet 1)		
Initial abstraction	Ia=	4.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	75.8 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$				

100 (yr)
280.32 (mm)
0.64
0.145
1.330 m ³ /s 0.268 (GIS)
216.5
7101.16 (m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 11	Rev 1
Job Title Calc Title Clevedon Meadows TP108 Calculation PR Catchment 4	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	2.47	224.37
C	Proposed Roads	94.4	1.62	153.11
C	Existing Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	508.97

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{508.97}{5.870} = 86.7$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.7616}{5.870} = 2.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.464 km (along drainage path)

Catchment Slope Sc = 0.0836 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{86.7}{200 - 86.7} = 0.77$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.60 1.16 2.11 = 0.12 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.08 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 12	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 4	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A= 0.058699 km2(100ha =1km2)

Runoff curve number

CN= 86.7 (from worksheet 1)

Initial abstraction

la= 2.4 mm (from worksheet 1)

Time of concentration

tc= 0.17 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

= 38.9 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

280.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.78

6. Specific peak flow rate q^*

0.158

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

2.600 m3/s

0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

243.8

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

14311.80 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 13	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 5	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	2.40	217.70
C	Proposed Roads	94.4	1.51	142.07
C	Existing Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	491.27

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{491.27}{5.680} = 86.5$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.7220}{5.680} = 2.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.436 km (along drainage path)

Catchment Slope Sc = 0.038 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{86.5}{200 - 86.5} = 0.76$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.58 1.16 2.67 = 0.15 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.10 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 14	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 5	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A= 0.056796 km2(100ha =1km2)

Runoff curve number

CN= 86.5 (from worksheet 1)

Initial abstraction

la= 2.4 mm (from worksheet 1)

Time of concentration

tc= 0.17 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

= 39.6 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

280.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.78

6. Specific peak flow rate q^*

0.158

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

2.512 m3/s

0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

243.2

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

13814.17 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 15	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 6	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.47	42.95
C	Proposed Roads	94.4	0.10	9.22
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	52.17

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{52.17}{0.571} = 91.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1566}{0.571} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.054 km (along drainage path)

Catchment Slope Sc = 0.01 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.4}{200 - 91.4} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.15 1.10 3.98 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.04 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 16	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 6	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A=

0.005707 km2(100ha =1km2)

Runoff curve number

CN=

91.4 (from worksheet 1)

Initial abstraction

la=

1.4 mm (from worksheet 1)

Time of concentration

tc=

0.17 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

=

23.8 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

280.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.85

6. Specific peak flow rate q^*

0.163

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

0.260 m3/s

0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

257.0

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

1466.57 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 17	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 7	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.92	174.60
C	Proposed Roads	94.4	1.29	122.02
C	Existing Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	4.993 428.12

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{428.12}{4.993} = 85.8$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.5478}{4.993} = 2.6 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.39 km (along drainage path)

Catchment Slope Sc = 0.1 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{85.8}{200 - 85.8} = 0.75$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.54 1.17 2.00 = 0.11 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.07 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 18	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 7	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A= 0.049925 km2(100ha =1km2)

Runoff curve number

CN= 85.8 (from worksheet 1)

Initial abstraction

la= 2.6 mm (from worksheet 1)

Time of concentration

tc= 0.17 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

= 42.2 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

280.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.77

6. Specific peak flow rate q^*

0.157

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

2.196 m3/s

0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

241.1

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

12038.56 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 19	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 8	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.65	58.86
C	Proposed Roads	94.4	0.11	10.03
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	68.89

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{68.89}{0.755} = 91.3$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2104}{0.755} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.65 km (along drainage path)

Catchment Slope Sc = 0.1 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.3}{200 - 91.3} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.75 1.10 2.00 = 0.14 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.09 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 20	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 8	Author ML	Date 15/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.007545 km ² (100ha =1km ²)	
Runoff curve number	CN=	91.3 (from worksheet 1)	
Initial abstraction	Ia=	1.4 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	24.2 mm	
3. Average recurrence interval, ARI			
		100 (yr)	
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)	
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$		0.85	
6. Specific peak flow rate q^*		0.162	
7. Peak flow rate, $q_p = q^* A P_{24}$		0.344 m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		256.7	
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		1936.60 (m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 21	Rev 1
Job Title Calc Title Clevedon Meadows TP108 Calculation PR Catchment 9	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.27	115.74
C	Proposed Roads	94.4	1.29	122.02
C	Existing Lots	74	1.17	86.58
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	324.34

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{324.34}{3.737} = 86.8$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.7463}{3.737} = 2.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.309 km (along drainage path)

Catchment Slope Sc = 0.08 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{86.8}{200 - 86.8} = 0.77$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.46 1.16 2.13 = 0.10 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 22	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 9	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A= 0.037373 km2(100ha =1km2)

Runoff curve number

CN= 86.8 (from worksheet 1)

Initial abstraction

la= 2.3 mm (from worksheet 1)

Time of concentration

tc= 0.17 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

= 38.7 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

280.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.78

6. Specific peak flow rate q^*

0.158

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

1.656 m3/s

0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

244.0

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

9120.22 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 23	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 10	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.64	58.13
C	Proposed Roads	94.4	0.12	10.89
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	69.02

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{69.02}{0.756} = 91.3$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2094}{0.756} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.88 km (along drainage path)

Catchment Slope Sc = 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.3}{200 - 91.3} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.92 1.10 2.46 = 0.21 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.14 hrs

OK
use
0.20862886 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 24	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 10	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.007556 km ² (100ha =1km ²)		
Runoff curve number	CN=	91.3 (from worksheet 1)		
Initial abstraction	Ia=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.21 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		24.1 mm	
3. Average recurrence interval, ARI		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.85		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.344	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		256.8		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		1940.32		(m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 25	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 11	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.63	57.62
C	Proposed Roads	94.4	0.72	68.00
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.355 125.62

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{125.62}{1.355} = 92.7$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2984}{1.355} = 1.1 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.22 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.7}{200 - 92.7} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.37 1.08 2.46 = 0.08 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 26	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 11	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.013549 km ² (100ha =1km ²)		
Runoff curve number	CN=	92.7 (from worksheet 1)		
Initial abstraction	Ia=	1.1 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	20.0 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.87		
6. Specific peak flow rate q^*		0.164		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.621	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		260.6		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		3530.72	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 27	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 12	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.63	57.62
C	Proposed Roads	94.4	0.05	4.97
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.687 62.60

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{62.60}{0.687} = 91.1$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1983}{0.687} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.085 km (along drainage path)

Catchment Slope Sc = 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.1}{200 - 91.1} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.20 1.10 2.46 = 0.04 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 28	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 12	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.006873 km ² (100ha =1km ²)		
Runoff curve number	CN=	91.1 (from worksheet 1)		
Initial abstraction	Ia=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		24.9 mm	
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100 (yr)
280.32 (mm)
0.85
0.162
0.313 m ³ /s 0.268 (GIS)
256.0
1759.69 (m ³)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 29	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 13	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.42	39.24
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.416 39.24

CN (weighted) = $\frac{\text{total product} = 39.24}{\text{total area} = 0.416} = 94.4$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.0624}{\text{total area} = 0.416} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.134 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{94.4}{200 - 94.4} = 0.89$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

=	0.14	0.6	0.27	1.06	2.46	=	<u>0.06</u> hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.04 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 30	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 13	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.004157 km ² (100ha =1km ²)		
Runoff curve number	CN=	94.4 (from worksheet 1)		
Initial abstraction	Ia=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	15.1 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.90		
6. Specific peak flow rate q^*		0.165		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.192 m ³ /s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		265.3		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		1102.74 (m ³)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 31	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 13A	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.16	14.92
C	Existing Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.158 14.92

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{14.92}{0.158} = 94.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0237}{0.158} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.087 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{94.4}{200 - 94.4} = 0.89$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14	0.6	0.20	1.06	2.46	= <u>0.04</u> hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 32	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 13A	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.001581 km ² (100ha =1km ²)		
Runoff curve number	CN=	94.4 (from worksheet 1)		
Initial abstraction	Ia=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	15.1 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		280.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.90		
6. Specific peak flow rate q^*		0.165		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.073 m ³ /s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		265.3		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		419.40 (m ³)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 1	Rev 1
Job Title Clevedon Meadows Calc Title TP108 Calculation PR Catchment 14	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	6.62	601.07
C	Proposed Roads	94.4	3.00	283.28
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	9.621 884.35

CN (weighted) = $\frac{\text{total product} = 884.35}{\text{total area} = 9.621} = 91.9$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 2.4360}{\text{total area} = 9.621} = 1.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.814 km (along drainage path)

Catchment Slope Sc= 0.007 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.9}{200 - 91.9} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14	0.6	0.87	1.09	4.43	= <u>0.36</u> hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.24 hrs

OK
use
0.35516677 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 2	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 14	Author ML	Date 15/11/2024	Checked JD

1. Data

Catchment Area

A= 0.096206 km2(100ha =1km2)

Runoff curve number

CN= 91.9 (from worksheet 1)

Initial abstraction

la= 1.3 mm (from worksheet 1)

Time of concentration

tc= 0.36 hrs (from worksheet 1)

2. Calculate storage, $S = (1000/CN - 10)25.4$

= 22.3 mm

3. Average recurrence interval, ARI

100 (yr)

4. 24 hour rainfall depth, P₂₄

282.32 (mm)

5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$

0.86

6. Specific peak flow rate q^*

0.131

7. Peak flow rate, $q_p = q^*A \cdot P_{24}$

3.558 m3/s 0.268 (GIS)

8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$

260.4

9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$

25049.87 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 3	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 15	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.67	60.65
C	Proposed Roads	94.4	0.44	41.48
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.107 102.12

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{102.12}{1.107} = 92.2$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2663}{1.107} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.261 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.2}{200 - 92.2} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.41 1.09 2.46 = 0.09 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 4	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 15	Author ML	Date 1/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.011073 km2(100ha =1km2)	
Runoff curve number	CN=	92.2 (from worksheet 1)	
Initial abstraction	la=	1.2 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	21.4 mm	
3. Average recurrence interval, ARI			
4. 24 hour rainfall depth, P ₂₄			
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$			
6. Specific peak flow rate q^*			
7. Peak flow rate, $q_p = q^* A P_{24}$			
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$			
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$			

100
282.32
0.87
0.163
0.510
261.2
2892.59

	(yr)	
	(mm)	
	m3/s	0.268 (GIS)
	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 5	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 16	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	5.97	541.63
C	Proposed Roads	94.4	2.55	240.55
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	8.513 782.18

CN (weighted) = $\frac{\text{total product} = 782.18}{\text{total area} = 8.513} = 91.9$

Ia (average) = $\frac{5 \times \text{pervious area} = 2.1718}{\text{total area} = 8.513} = 1.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.814 km (along drainage path)

Catchment Slope Sc= 0.0066 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.9}{200 - 91.9} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.87 1.09 4.51 = 0.36 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.24 hrs

OK
use
0.36134542 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 6	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 16	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.085133 km2(100ha =1km2)		
Runoff curve number	CN=	91.9 (from worksheet 1)		
Initial abstraction	la=	1.3 mm (from worksheet 1)		
Time of concentration	tc=	0.36 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	22.5 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100 (yr)
282.32 (mm)
0.86
0.131
3.149 m3/s 0.268 (GIS)
260.3
22155.94 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 7	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 16A	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	5.26	478.03
C	Proposed Roads	94.4	2.43	229.26
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	7.693 707.29

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{707.29}{7.693} = 91.9$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.9437}{7.693} = 1.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.814 km (along drainage path)

Catchment Slope Sc= 0.0066 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.9}{200 - 91.9} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.87 1.09 4.51 = 0.36 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.24 hrs

OK
use
0.36110983 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES	Job Number 194006	Sheet 9	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 17	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.18	16.58
C	Proposed Roads	94.4	0.72	67.81
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	84.39

CN (weighted) = $\frac{\text{total product} = 84.39}{\text{total area} = 0.901} = 93.7$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.1625}{\text{total area} = 0.901} = 0.9 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.113 km (along drainage path)

Catchment Slope Sc = 0.14 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{93.7}{200 - 93.7} = 0.88$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.24 1.07 1.80 = 0.04 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 10	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 17	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.009009 km2(100ha =1km2)		
Runoff curve number	CN=	93.7 (from worksheet 1)		
Initial abstraction	la=	0.9 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		17.2 mm	
3. Average recurrence interval, ARI		100	(yr)	
4. 24 hour rainfall depth, P24		282.32	(mm)	
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.89		
6. Specific peak flow rate q^*		0.164		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.418	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		265.2		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		2389.55	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 11	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 18	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.10	8.94
C	Proposed Roads	94.4	0.25	23.50
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.347 32.44

CN (weighted) = $\frac{\text{total product} = 32.44}{\text{total area} = 0.347} = 93.4$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.0669}{\text{total area} = 0.347} = 1.0 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.062 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{93.4}{200 - 93.4} = 0.88$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

=	0.14	0.6	0.16	1.08	2.46	=	<u>0.04</u> hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.02 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 12	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 18	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.003474 km2(100ha =1km2)		
Runoff curve number	CN=	93.4 (from worksheet 1)		
Initial abstraction	la=	1.0 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		18.0 mm	
3. Average recurrence interval, ARI		100	(yr)	
4. 24 hour rainfall depth, P24		282.32	(mm)	
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.89		
6. Specific peak flow rate q^*		0.164		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.161	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		264.4		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		918.64	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 13	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 19	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	4.25	385.80
C	Proposed Roads	94.4	2.03	191.96
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	577.76

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{577.76}{6.282} = 92.0$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.5797}{6.282} = 1.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.689 km (along drainage path)

Catchment Slope Sc = 0.068 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.0}{200 - 92.0} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

=	0.14	0.6	0.78	1.09	2.24	=	0.16 hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.11 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 14	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 19	Author ML	Date 1/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.062824 km ² (100ha =1km ²)	
Runoff curve number	CN=	92.0 (from worksheet 1)	
Initial abstraction	la=	1.3 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	22.2 mm	
3. Average recurrence interval, ARI			
		100 (yr)	
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)	
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.86	
6. Specific peak flow rate q^*		0.163	
7. Peak flow rate, $q_p = q^* A P_{24}$		2.892 m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		260.5	
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		16365.36 (m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 15	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 20	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.21	19.08
C	Proposed Roads	94.4	0.17	15.75
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.377 34.82

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{34.82}{0.377} = 92.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0881}{0.377} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.099 km (along drainage path)

Catchment Slope Sc = 0.04 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.4}{200 - 92.4} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.22 1.09 2.63 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Job Title	Clevedon Meadows
Calc Title	TP108 Calculation
	PR Catchment 20

Author
ML

Date
1/11/2024

Checked
JD

- | | | | |
|---|-----|--|-------------|
| 1. Data | | | |
| Catchment Area | A= | 0.003769 km ² (100ha =1km ²) | |
| Runoff curve number | CN= | 92.4 (from worksheet 1) | |
| Initial abstraction | la= | 1.2 mm (from worksheet 1) | |
| Time of concentration | tc= | 0.17 hrs (from worksheet 1) | |
| 2. Calculate storage, $S = (1000/CN - 10)25.4$ | = | | 20.9 mm |
| 3. Average recurrence interval, ARI | | 100 (yr) | |
| 4. 24 hour rainfall depth, P ₂₄ | | 282.32 (mm) | |
| 5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$ | | 0.87 | |
| 6. Specific peak flow rate q^* | | 0.163 | |
| 7. Peak flow rate, $q_p = q^* A P_{24}$ | | 0.174 m ³ /s | 0.268 (GIS) |
| 8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$ | | 261.7 | |
| 9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$ | | 986.30 (m ³) | |

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 17	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 21	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	3.71	337.12
C	Proposed Roads	94.4	1.74	164.52
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	5.456 501.64

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{501.64}{5.456} = 92.0$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.3753}{5.456} = 1.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.608 km (along drainage path)

Catchment Slope Sc= 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.0}{200 - 92.0} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.72 1.09 2.22 = 0.15 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.10 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 18	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 21	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.054556 km2(100ha =1km2)		
Runoff curve number	CN=	92.0 (from worksheet 1)		
Initial abstraction	la=	1.3 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	22.2 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100
282.32
0.86
0.163
2.511
260.5
14209.27

	(yr)		
	(mm)		
	m3/s	0.268 (GIS)	
	(m3)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 19	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 22	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.07	6.17
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.065 6.17

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{6.17}{0.065} = 94.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0098}{0.065} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.033 km (along drainage path)

Catchment Slope Sc = 0.01 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{94.4}{200 - 94.4} = 0.89$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.11 1.06 3.98 = 0.04 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 20	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 22	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.000654 km2(100ha =1km2)		
Runoff curve number	CN=	94.4 (from worksheet 1)		
Initial abstraction	la=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		15.1 mm	
3. Average recurrence interval, ARI		100	(yr)	
4. 24 hour rainfall depth, P24		282.32	(mm)	
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.90		
6. Specific peak flow rate q^*		0.165		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.030	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		267.3		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		174.79	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 21	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 23	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	2.75	249.98
C	Proposed Roads	94.4	1.52	143.03
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	4.268 393.02

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{393.02}{4.268} = 92.1$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.0532}{4.268} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.481 km (along drainage path)

Catchment Slope Sc = 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.1}{200 - 92.1} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.62 1.09 2.22 = 0.13 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.08 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Job Title	Clevedon Meadows
Calc Title	TP108 Calculation
	PR Catchment 23

Author
ML

Date
1/11/2024

Checked
JD

- | | | | |
|---|------------------|--|-------------------------------|
| 1. Data | | | |
| Catchment Area | A= | 0.042683 km ² (100ha =1km ²) | |
| Runoff curve number | CN= | 92.1 (from worksheet 1) | |
| Initial abstraction | Ia= | 1.2 mm (from worksheet 1) | |
| Time of concentration | t _c = | 0.17 hrs (from worksheet 1) | |
| 2. Calculate storage, $S = (1000/CN - 10)25.4$ | = | | 21.9 mm |
| 3. Average recurrence interval, ARI | | 100 (yr) | |
| 4. 24 hour rainfall depth, P ₂₄ | | 282.32 (mm) | |
| 5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$ | | 0.86 | |
| 6. Specific peak flow rate q^* | | 0.163 | |
| 7. Peak flow rate, $q_p = q^* A P_{24}$ | | 1.966 | m ³ /s 0.268 (GIS) |
| 8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$ | | 260.8 | |
| 9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$ | | 11132.13 | (m ³) |

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 23	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 24	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.76	69.12
C	Proposed Roads	94.4	0.17	15.82
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	84.94

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{84.94}{0.929} = 91.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2535}{0.929} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.09 km (along drainage path)

Catchment Slope Sc = 0.02 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.4}{200 - 91.4} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.20 1.10 3.23 = 0.06 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.04 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 24	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 24	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.009288 km2(100ha =1km2)		
Runoff curve number	CN=	91.4 (from worksheet 1)		
Initial abstraction	la=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.7 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P24				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100 (yr)
282.32 (mm)
0.85
0.163
0.427 m3/s 0.268 (GIS)
259.1
2406.13 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 25	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 25	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.99	180.89
C	Proposed Roads	94.4	1.27	119.73
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	3.261 300.62

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{300.62}{3.261} = 92.2$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.7879}{3.261} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.446 km (along drainage path)

Catchment Slope Sc= 0.075 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.2}{200 - 92.2} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.59 1.09 2.18 = 0.12 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.08 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 26	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 25	Author ML	Date 1/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.032605 km ² (100ha =1km ²)	
Runoff curve number	CN=	92.2 (from worksheet 1)	
Initial abstraction	la=	1.2 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	21.5 mm	
3. Average recurrence interval, ARI			
4. 24 hour rainfall depth, P ₂₄			
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$			
6. Specific peak flow rate q^*			
7. Peak flow rate, $q_p = q^* A P_{24}$			
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$			
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$			

100
282.32
0.87
0.163
1.503
261.2
8514.81

	(yr)	
	(mm)	
	m ³ /s	0.268 (GIS)
	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 27	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 26	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.09	8.77
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.093 8.77

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8.77}{0.093} = 94.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0139}{0.093} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.042 km (along drainage path)

Catchment Slope Sc= 0.24 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{94.4}{200 - 94.4} = 0.89$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.12 1.06 1.53 = 0.02 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.01 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 28	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 26	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.000929 km2(100ha =1km2)		
Runoff curve number	CN=	94.4 (from worksheet 1)		
Initial abstraction	la=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		15.1 mm	
3. Average recurrence interval, ARI		100	(yr)	
4. 24 hour rainfall depth, P24		282.32	(mm)	
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.90		
6. Specific peak flow rate q^*		0.165		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.043	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		267.3		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		248.29	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 29	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 27	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.99	180.86
C	Proposed Roads	94.4	1.18	111.00
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	3.168 291.86

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{291.86}{3.168} = 92.1$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.7739}{3.168} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.387 km (along drainage path)

Catchment Slope Sc= 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.1}{200 - 92.1} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.53 1.09 2.22 = 0.11 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.07 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 30	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 27	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.031677 km2(100ha =1km2)		
Runoff curve number	CN=	92.1 (from worksheet 1)		
Initial abstraction	la=	1.2 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	21.7 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P24				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100 (yr)
282.32 (mm)
0.87
0.163
1.459 m3/s 0.268 (GIS)
261.0
8266.82 (m3)

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 31	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 28	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.17	15.50
C	Proposed Roads	94.4	0.65	61.80
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.825 77.30

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{77.30}{0.825} = 93.7$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1494}{0.825} = 0.9 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.106 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{93.7}{200 - 93.7} = 0.88$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.23 1.07 2.46 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 32	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 28	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.008254 km2(100ha =1km2)		
Runoff curve number	CN=	93.7 (from worksheet 1)		
Initial abstraction	la=	0.9 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		17.2 mm	
3. Average recurrence interval, ARI		100	(yr)	
4. 24 hour rainfall depth, P24		282.32	(mm)	
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.89		
6. Specific peak flow rate q^*		0.164		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.383	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		265.2		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		2188.96	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 33	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 29	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	1.34	121.41
C	Proposed Roads	94.4	0.85	80.22
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	2.187 201.63

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{201.63}{2.187} = 92.2$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.5286}{2.187} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.981 km (along drainage path)

Catchment Slope Sc= 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.2}{200 - 92.2} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.99 1.09 2.22 = 0.20 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.13 hrs

OK
use
0.20072199 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 34	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 29	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.021869 km2(100ha =1km2)		
Runoff curve number	CN=	92.2 (from worksheet 1)		
Initial abstraction	la=	1.2 mm (from worksheet 1)		
Time of concentration	tc=	0.20 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	21.5 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P24		282.32 (mm)		
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.87		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^* A P_{24}$		1.008 m3/s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		261.1		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		5711.01 (m3)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 35	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 30	Author ML	Date 15/11/2024
		Checked JD	

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.67	60.72
C	Proposed Roads	94.4	0.14	13.35
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	0.810	74.07

CN (weighted) = $\frac{\text{total product} = 74.07}{\text{total area} = 0.810} = 91.4$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.2218}{\text{total area} = 0.810} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.106 km (along drainage path)

Catchment Slope Sc = 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.4}{200 - 91.4} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.23 1.10 2.22 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 36	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 30	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.008101 km2(100ha =1km2)		
Runoff curve number	CN=	91.4 (from worksheet 1)		
Initial abstraction	la=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.8 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$				

100
282.32
0.85
0.163
0.372
259.0
2098.15

	m3/s	0.268 (GIS)
	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 37	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 31	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.67	60.72
C	Proposed Roads	94.4	0.14	13.35
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	74.07

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{74.07}{0.810} = 91.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2218}{0.810} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.106 km (along drainage path)

Catchment Slope Sc = 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.4}{200 - 91.4} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.23 1.10 2.22 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 38	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 31	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.008101 km2(100ha =1km2)		
Runoff curve number	CN=	91.4 (from worksheet 1)		
Initial abstraction	la=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.8 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100
282.32
0.85
0.163
0.372
259.0
2098.15

	m3/s	0.268 (GIS)
	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 39	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 32	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.67	60.72
C	Proposed Roads	94.4	0.14	13.35
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.810 74.07

CN (weighted) = $\frac{\text{total product} = 74.07}{\text{total area} = 0.810} = 91.4$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.2218}{\text{total area} = 0.810} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.106 km (along drainage path)

Catchment Slope Sc = 0.07 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.4}{200 - 91.4} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.23 1.10 2.22 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 40	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 32	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.008101 km2(100ha =1km2)		
Runoff curve number	CN=	91.4 (from worksheet 1)		
Initial abstraction	la=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.8 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P24				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

100
282.32
0.85
0.163
0.372
259.0
2098.15

	m3/s	0.268 (GIS)
	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 41	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 33	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.26	24.21
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	24.21

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{24.21}{0.257} = 94.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0385}{0.257} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.12 km (along drainage path)

Catchment Slope Sc = 0.08 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{94.4}{200 - 94.4} = 0.89$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.25 1.06 2.13 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 42	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 33	Author ML	Date 1/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.002565 km2(100ha =1km2)	
Runoff curve number	CN=	94.4 (from worksheet 1)	
Initial abstraction	la=	0.8 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	15.1 mm	
3. Average recurrence interval, ARI			
4. 24 hour rainfall depth, P24			
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$			
6. Specific peak flow rate q^*			
7. Peak flow rate, $q_p = q^* A P_{24}$			
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$			
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$			

100
282.32
0.90
0.165
0.119
267.3
685.54

	(yr)	
	(mm)	
	m3/s	0.268 (GIS)
	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 43	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 34	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.00	0.00
C	Proposed Roads	94.4	0.26	24.21
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.257 24.21

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{24.21}{0.257} = 94.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0385}{0.257} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.091 km (along drainage path)

Catchment Slope Sc = 0.08 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{94.4}{200 - 94.4} = 0.89$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.21 1.06 2.13 = 0.04 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 44	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 34	Author ML	Date 1/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.002565 km2(100ha =1km2)		
Runoff curve number	CN=	94.4 (from worksheet 1)		
Initial abstraction	la=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	15.1 mm		
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P24				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^* A P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$				

	100	(yr)	
	282.32	(mm)	
	0.90		
	0.165		
	0.119	m3/s	0.268 (GIS)
	267.3		
	685.54	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES		Job Number 194006	Sheet 1	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 35	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	3.58	325.15
C	Proposed Roads	94.4	1.04	97.75
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	4.617 422.91

CN (weighted) = $\frac{\text{total product} = 422.91}{\text{total area} = 4.617} = 91.6$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 1.0743}{\text{total area} = 4.617} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.476 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.6}{200 - 91.6} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.61 1.10 2.46 = 0.14 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.09 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 2	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 35	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.046165 km ² (100ha =1km ²)		
Runoff curve number	CN=	91.6 (from worksheet 1)		
Initial abstraction	Ia=	1.2 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.3 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.86		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		2.122 m ³ /s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		259.7		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		11987.45 (m ³)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 3	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 36	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	4.11	372.83
C	Proposed Roads	94.4	1.15	108.89
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	5.260 481.72

CN (weighted) = $\frac{\text{total product} = 481.72}{\text{total area} = 5.260} = 91.6$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 1.4049}{\text{total area} = 5.260} = 1.3 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.527 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.6}{200 - 91.6} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.66 1.10 2.46 = 0.15 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.10 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 4	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 36	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.052596 km ² (100ha =1km ²)		
Runoff curve number	CN=	91.6 (from worksheet 1)		
Initial abstraction	la=	1.3 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.3 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.86		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		2.417	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		259.4		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		13645.92	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 5	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 36A	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.52	47.65
C	Proposed Roads	94.4	0.12	11.47
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	59.12

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{59.12}{0.646} = 91.5$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1757}{0.646} = 1.4 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.075 km (along drainage path)

Catchment Slope Sc = 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.5}{200 - 91.5} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.18 1.10 2.46 = 0.04 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 6	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 36A	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.006463 km ² (100ha =1km ²)		
Runoff curve number	CN=	91.5 (from worksheet 1)		
Initial abstraction	Ia=	1.4 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.7 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.86		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.297	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		259.1		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		1674.78	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 7	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 37	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	3.06	277.78
C	Proposed Roads	94.4	0.92	86.68
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	3.978 364.46

CN (weighted) = $\frac{\text{total product} = 364.46}{\text{total area} = 3.978} = 91.6$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.9178}{\text{total area} = 3.978} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.421 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.6}{200 - 91.6} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.56 1.10 2.46 = 0.13 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.09 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 8	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 37	Author ML	Date 15/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.039775 km ² (100ha =1km ²)	
Runoff curve number	CN=	91.6 (from worksheet 1)	
Initial abstraction	Ia=	1.2 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.2 mm	
3. Average recurrence interval, ARI			
		100 (yr)	
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)	
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.86	
6. Specific peak flow rate q^*		0.163	
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		1.828 m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		259.7	
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		10330.99 (m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 9	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 38	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	3.06	277.52
C	Proposed Roads	94.4	0.74	70.23
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	3.800 347.75

CN (weighted) = $\frac{\text{total product} = 347.75}{\text{total area} = 3.800} = 91.5$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.9169}{\text{total area} = 3.800} = 1.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.4 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.5}{200 - 91.5} = 0.84$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.55 1.10 2.46 = 0.12 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.08 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 10	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 38	Author ML	Date 15/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.038004 km ² (100ha =1km ²)	
Runoff curve number	CN=	91.5 (from worksheet 1)	
Initial abstraction	Ia=	1.2 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	23.6 mm	
3. Average recurrence interval, ARI			
		100 (yr)	
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)	
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$		0.86	
6. Specific peak flow rate q^*		0.163	
7. Peak flow rate, $q_p = q^* A P_{24}$		1.746 m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		259.4	
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		9856.62 (m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 11	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 39	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.38	34.85
C	Proposed Roads	94.4	0.36	33.60
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	68.45

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{68.45}{0.740} = 92.5$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1151}{0.740} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.19 km (along drainage path)

Catchment Slope Sc = 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.5}{200 - 92.5} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

=	0.14	0.6	0.33	1.09	2.46	=	0.07 hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.05 hrs

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 12	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 39	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.007397 km2(100ha =1km2)		
Runoff curve number	CN=	92.5 (from worksheet 1)		
Initial abstraction	la=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	20.5 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P24		282.32 (mm)		
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.87		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.341	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		262.4		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		1941.22	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 13	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 40	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m ² =1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.36	32.32
C	Proposed Roads	94.4	0.28	26.44
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	58.76

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{58.76}{0.636} = 92.4$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1068}{0.636} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.131 km (along drainage path)

Catchment Slope Sc = 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.4}{200 - 92.4} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14	0.6	0.26	1.09	2.46	= 0.06 hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c = 0.04 \text{ hrs}$

NO GOOD use 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 14	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 40	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.00636 km ² (100ha =1km ²)		
Runoff curve number	CN=	92.4 (from worksheet 1)		
Initial abstraction	Ia=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	20.9 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$		0.87		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.293	m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		262.0		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		1666.29	(m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 15	Rev 1
Job Title Calc Title Clevedon Meadows TP108 Calculation PR Catchment 41	Author ML	Date 15/11/2024	Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.36	32.32
C	Proposed Roads	94.4	0.16	14.65
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	0.511

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{46.97}{0.511} = 91.9$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1068}{0.511} = 1.0 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.095 km (along drainage path)

Catchment Slope Sc = 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.9}{200 - 91.9} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.21 1.09 2.46 = 0.05 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.03 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 16	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 41	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.005111 km ² (100ha = 1km ²)		
Runoff curve number	CN=	91.9 (from worksheet 1)		
Initial abstraction	Ia=	1.0 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	22.4 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$		0.86		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.235 m ³ /s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		260.5		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		1331.52 (m ³)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 17	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 42	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.83	75.79
C	Proposed Roads	94.4	0.36	33.60
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.191 109.39

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{109.39}{1.191} = 91.9$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2504}{1.191} = 1.1 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.225 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{91.9}{200 - 91.9} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$
 = 0.14 0.6 0.37 1.09 2.46 = 0.08 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
 use
 0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 18	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 42	Author ML	Date 15/11/2024	Checked JD

1. Data			
Catchment Area	A=	0.011906 km ² (100ha =1km ²)	
Runoff curve number	CN=	91.9 (from worksheet 1)	
Initial abstraction	Ia=	1.1 mm (from worksheet 1)	
Time of concentration	tc=	0.17 hrs (from worksheet 1)	
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	22.5 mm	
3. Average recurrence interval, ARI			
		100 (yr)	
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)	
5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$		0.86	
6. Specific peak flow rate q^*		0.163	
7. Peak flow rate, $q_p = q^* A P_{24}$		0.548 m ³ /s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		260.5	
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		3101.16 (m ³)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 19	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 43	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.83	75.79
C	Proposed Roads	94.4	0.48	45.23
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.314 121.02

CN (weighted) = $\frac{\text{total product} = 121.02}{\text{total area} = 1.314} = 92.1$

Ia (average) = $\frac{5 \times \text{pervious area} = 5 \times 0.2504}{\text{total area} = 1.314} = 1.0 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.24 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.1}{200 - 92.1} = 0.85$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$
 = 0.14 0.6 0.39 1.09 2.46 = 0.09 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.06 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 20	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 43	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.013138 km2(100ha =1km2)		
Runoff curve number	CN=	92.1 (from worksheet 1)		
Initial abstraction	la=	1.0 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	21.7 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$		0.87		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$		0.605	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$		261.2		
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$		3431.37	(m3)	

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 21	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 44	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	0.83	75.73
C	Proposed Roads	94.4	0.78	73.22
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	1.610 148.94

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{148.94}{1.610} = 92.5$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2502}{1.610} = 0.8 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.414 km (along drainage path)

Catchment Slope Sc= 0.05 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{92.5}{200 - 92.5} = 0.86$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

= 0.14 0.6 0.56 1.09 2.46 = 0.13 hrs

SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.08 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 22	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 44	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.016096 km ² (100ha =1km ²)		
Runoff curve number	CN=	92.5 (from worksheet 1)		
Initial abstraction	Ia=	0.8 mm (from worksheet 1)		
Time of concentration	tc=	0.17 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=	20.5 mm		
3. Average recurrence interval, ARI				
		100 (yr)		
4. 24 hour rainfall depth, P ₂₄		282.32 (mm)		
5. Compute $c^* = P_{24} - 2Ia / P_{24} - 2Ia + 2S$		0.87		
6. Specific peak flow rate q^*		0.163		
7. Peak flow rate, $q_p = q^* A P_{24}$		0.743 m ³ /s	0.268 (GIS)	
8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$		262.4		
9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$		4224.26 (m ³)		

Worksheet 2: Graphical Peak Flow Rate

 MAVEN ASSOCIATES	Job Number 194006	Sheet 23	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 45	Author ML	Date 15/11/2024 Checked JD

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Proposed Lots (70/30)	90.8	4.11	372.83
C	Proposed Roads	94.4	1.15	108.89
C	Existing Lots	74	1.74	128.75
C	Existing Roads	94.4	0.00	0.00
* from Appendix B			Totals =	7.000 610.48

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{610.48}{7.000} = 87.2$

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 3.1448}{7.000} = 2.2 \text{ mm}$

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.677 km (along drainage path)

Catchment Slope Sc= 0.047 m/m (by equal area method)

Runoff factor, $\frac{\text{CN}}{200 - \text{CN}} = \frac{87.2}{200 - 87.2} = 0.77$

$t_c = 0.14 C L^{0.66} (\text{CN}/200 - \text{CN})^{-0.55} S_c^{-0.30}$

=	0.14	0.6	0.77	1.15	2.50	=	<u>0.19</u> hrs
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SCS Lag for HEC-HMS.... $t_p = 2/3 t_c$ = 0.13 hrs

OK
 use
 0.18717196 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

 MAVEN ASSOCIATES		Job Number 194006	Sheet 24	Rev 1
Job Title Calc Title	Clevedon Meadows TP108 Calculation PR Catchment 45	Author ML	Date 15/11/2024	Checked JD

1. Data				
Catchment Area	A=	0.069995 km2(100ha =1km2)		
Runoff curve number	CN=	87.2 (from worksheet 1)		
Initial abstraction	la=	2.2 mm (from worksheet 1)		
Time of concentration	tc=	0.19 hrs (from worksheet 1)		
2. Calculate storage, $S = (1000/CN - 10)25.4$	=		37.2 mm	
3. Average recurrence interval, ARI				
4. 24 hour rainfall depth, P ₂₄				
5. Compute $c^* = P_{24} - 2la/P_{24} - 2la + 2S$				
6. Specific peak flow rate q^*				
7. Peak flow rate, $q_p = q^*A \cdot P_{24}$				
8. Runoff depth, $Q_{24} = (P_{24} - la)^2 / (P_{24} - la) + S$				
9. Runoff volume, $V_{24} = 1000 \times Q_{24}A$				

100 (yr)
282.32 (mm)
0.79
0.162
3.201 m3/s 0.268 (GIS)
247.2
17303.76 (m3)

Worksheet 2: Graphical Peak Flow Rate

APPENDIX C – OVERLAND FLOWPATH MANNINGS CALCULATIONS

 MAVEN ASSOCIATES		Job Number 194006	Sheet 1	Rev A
Job Title Clevedon Meadows Calc Title Proposed Overland Flowpath - Section 1		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	122 l/s
S =	Longitudinal Slope	0.008 m/m
A =	Cross sectional area	0.254 m ²
P=	Wetted Perimeter	7.17 m
R =	Hydraulic Radius	0.035410567 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.008 m/m

Section Location 1

Depth=	0.08 m
Width=	5.64 m
S=	0.008 m/m
A=	0.254 m ²
P=	7.17 m
R=	0.035
n=	0.020

Velocity (V) 0.482 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.04

Channel Flow (Q) 122 l/sec

VxA

100 year peak discharge = 101 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 2	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 2				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q= Channel Flow 3030 l/s
S = Longitudinal Slope 0.003 m/m
A = Cross sectional area 3.255 m²
P = Wetted Perimeter 16.41 m
R = Hydraulic Radius 0.198318406 m
n = Mannings n 0.02

Longitudinal slope

S= **0.003** m/m

Section Location 2

Depth= 0.34 m
Width= 17.61 m
S= 0.003 m/m
A= 3.255 m²
P= 16.41 m
R= 0.198
n= 0.020

Velocity (V) 0.931 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.32

Channel Flow (Q) **3030** l/sec
VxA

100 year peak discharge = 2968 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 3	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 3				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	1871 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	2.086 m ²
P=	Wetted Perimeter	16.30 m
R =	Hydraulic Radius	0.12795976 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.005 m/m

Section Location 3

Depth=	0.27 m
Width=	16.00 m
S=	0.005 m/m
A=	2.086 m ²
P=	16.30 m
R=	0.128
n=	0.020

Velocity (V) 0.897 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.24

Channel Flow (Q) 1871 l/sec

VxA

100 year peak discharge = 1856 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 4	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 3A				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	1092 l/s
S =	Longitudinal Slope	0.003 m/m
A =	Cross sectional area	0.988 m ²
P=	Wetted Perimeter	3.85 m
R =	Hydraulic Radius	0.256423566 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.003 m/m

Section Location 3A

Depth=	0.38 m
Width=	3.73 m
S=	0.003 m/m
A=	0.988 m ²
P=	3.85 m
R=	0.256
n=	0.020

Velocity (V) 1.105 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.42

Channel Flow (Q) 1092 l/sec

VxA

100 year peak discharge = 1053 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 5	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 3B				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	1339 l/s
S =	Longitudinal Slope	0.003 m/m
A =	Cross sectional area	1.145 m ²
P=	Wetted Perimeter	4.10 m
R =	Hydraulic Radius	0.279200195 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.003 m/m

Section Location 3B

Depth=	0.43 m
Width=	3.96 m
S=	0.003 m/m
A=	1.145 m ²
P=	4.10 m
R=	0.279
n=	0.020

Velocity (V) 1.169 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.50

Channel Flow (Q) 1339 l/sec

VxA

100 year peak discharge = 1330 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 6	Rev A
Job Title Clevedon Meadows Calc Title Proposed Overland Flowpath - Section 4		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	2698 l/s
S =	Longitudinal Slope	0.007 m/m
A =	Cross sectional area	2.448 m ²
P=	Wetted Perimeter	18.09 m
R =	Hydraulic Radius	0.135360796 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.007 m/m

Section Location 4

Depth=	0.28 m
Width=	17.81 m
S=	0.007 m/m
A=	2.448 m ²
P=	18.09 m
R=	0.135
n=	0.020

Velocity (V) 1.102 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.31

Channel Flow (Q) 2698 l/sec

VxA

100 year peak discharge = 2600 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 7	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 5				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	2546 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	2.627 m ²
P=	Wetted Perimeter	18.29 m
R =	Hydraulic Radius	0.144 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.005 m/m

Section Location 5

Depth=	0.29 m
Width=	18.00 m
S=	0.005 m/m
A=	2.627 m ²
P=	18.29 m
R=	0.144
n=	0.020

Velocity (V) 0.969 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.28

Channel Flow (Q) 2546 l/sec

VxA

100 year peak discharge = 2512 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 8	Rev A
Job Title Clevedon Meadows Calc Title Proposed Overland Flowpath - Section 6		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	279 l/s
S =	Longitudinal Slope	0.009 m/m
A =	Cross sectional area	0.403 m ²
P=	Wetted Perimeter	7.23 m
R =	Hydraulic Radius	0.055778547 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.009 m/m

Section Location 6

Depth=	0.11 m
Width=	7.00 m
S=	0.009 m/m
A=	0.403 m ²
P=	7.23 m
R=	0.056
n=	0.020

Velocity (V) 0.692 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.08

Channel Flow (Q) 279 l/sec

VxA

100 year peak discharge = 260 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 9	Rev A
Job Title Clevedon Meadows Calc Title Proposed Overland Flowpath - Section 7		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where Q= Channel Flow 2218 l/s
S = Longitudinal Slope 0.006 m/m
A = Cross sectional area 2.254 m²
P = Wetted Perimeter 17.58 m
R = Hydraulic Radius 0.128221173 m
n = Mannings n 0.02

Longitudinal slope

S= 0.006 m/m

Section Location 7

Depth= 0.27 m
Width= 17.31 m
S= 0.006 m/m
A= 2.254 m²
P= 17.58 m
R= 0.128
n= 0.020

Velocity (V) 0.984 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.27

Channel Flow (Q) 2218 l/sec
VxA

100 year peak discharge = 2196 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 10	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 8				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	365 l/s
S =	Longitudinal Slope	0.006 m/m
A =	Cross sectional area	0.524 m ²
P =	Wetted Perimeter	6.87 m
R =	Hydraulic Radius	0.076329206 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.006 m/m

Section Location 8

Depth =	0.13 m
Width =	6.60 m
S =	0.006 m/m
A =	0.524 m ²
P =	6.87 m
R =	0.076
n =	0.020

Velocity (V) 0.696 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.09

Channel Flow (Q) 365 l/sec

VxA

100 year peak discharge = 344 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 11	Rev A
Job Title Clevedon Meadows Calc Title Proposed Overland Flowpath - Section 9		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	1677 l/s
S =	Longitudinal Slope	0.013 m/m
A =	Cross sectional area	1.353 m ²
P=	Wetted Perimeter	13.33 m
R =	Hydraulic Radius	0.101500375 m
n =	Mannings n	0.02

Longitudinal slope

S= **0.013** m/m

Section Location 9

Depth=	0.21 m
Width=	13.07 m
S=	0.013 m/m
A=	1.353 m ²
P=	13.33 m
R=	0.102
n=	0.020

Velocity (V) 1.240 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.26

Channel Flow (Q) **1677** l/sec

VxA

100 year peak discharge = 1656 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 12	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 10				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	350 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.56 m ²
P =	Wetted Perimeter	7.52 m
R =	Hydraulic Radius	0.074487896 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location 10

Depth =	0.13 m
Width =	6.60 m
S =	0.005 m/m
A =	0.56 m ²
P =	7.52 m
R =	0.074
n =	0.020

Velocity (V) 0.625 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.08

Channel Flow (Q) 350 l/sec

VxA

100 year peak discharge = 344 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 13	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 11				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	666 l/s
S =	Longitudinal Slope	0.013 m/m
A =	Cross sectional area	0.654 m ²
P=	Wetted Perimeter	8.66 m
R =	Hydraulic Radius	0.075545801 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.013 m/m

Section Location 11

Depth=	0.14 m
Width=	8.39 m
S=	0.013 m/m
A=	0.654 m ²
P=	8.66 m
R=	0.076
n=	0.020

Velocity (V) 1.018 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.14

Channel Flow (Q) 666 l/sec

VxA

100 year peak discharge = 621 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 14	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 12				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	335 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.526 m ²
P =	Wetted Perimeter	6.87 m
R =	Hydraulic Radius	0.076620539 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location 12

Depth =	0.13 m
Width =	6.60 m
S =	0.005 m/m
A =	0.526 m ²
P =	6.87 m
R =	0.077
n =	0.020

Velocity (V) 0.637 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.08

Channel Flow (Q) 335 l/sec

VxA

100 year peak discharge = 313 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 15	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 13				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	213 l/s
S =	Longitudinal Slope	0.004 m/m
A =	Cross sectional area	0.438 m ²
P=	Wetted Perimeter	7.23 m
R =	Hydraulic Radius	0.060547415 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.004 m/m

Section Location 13

Depth=	0.11 m
Width=	7.00 m
S=	0.004 m/m
A=	0.438 m ²
P=	7.23 m
R=	0.061
n=	0.020

Velocity (V) 0.487 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.05

Channel Flow (Q) 213 l/sec

VxA

100 year peak discharge = 192 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 16	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 13A				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	80 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.208 m ²
P =	Wetted Perimeter	5.74 m
R =	Hydraulic Radius	0.036236934 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location 13A

Depth =	0.08 m
Width =	5.26 m
S =	0.005 m/m
A =	0.208 m ²
P =	5.74 m
R =	0.036
n =	0.020

Velocity (V) 0.387 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.03

Channel Flow (Q) 80 l/sec

VxA

100 year peak discharge = 73 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 20	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 16A		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	2902 l/s
S =	Longitudinal Slope	0.007 m/m
A =	Cross sectional area	2.597 m ²
P=	Wetted Perimeter	18.79 m
R =	Hydraulic Radius	0.138 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.007 m/m

Section Location Section 16A

Depth=	0.29 m
Width=	18.53 m
S=	0.007 m/m
A=	2.597 m ²
P=	18.79 m
R=	0.138
n=	0.020

Velocity (V) 1.117 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.32

Channel Flow (Q) 2902 l/sec

VxA

100 year peak discharge = 2845 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 21	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 17		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q= Channel Flow 447 l/s
S = Longitudinal Slope 0.008 m/m
A = Cross sectional area 0.812 m²
P = Wetted Perimeter 18.79 m
R = Hydraulic Radius 0.043 m
n = Mannings n 0.02

Longitudinal slope

S= **0.008** m/m

Section Location Section 17

Depth= 0.16 m
Width= 9.27 m
S= 0.008 m/m
A= 0.812 m²
P= 18.79 m
R= 0.043
n= 0.020

Velocity (V) 0.550 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.09

Channel Flow (Q) **447** l/sec
VxA

100 year peak discharge = 418 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 22	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 18				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	166 l/s
S =	Longitudinal Slope	0.002 m/m
A =	Cross sectional area	0.628 m ²
P =	Wetted Perimeter	15.38 m
R =	Hydraulic Radius	0.041 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.002 m/m

Section Location Section 18

Depth =	0.14 m
Width =	7.56 m
S =	0.002 m/m
A =	0.628 m ²
P =	15.38 m
R =	0.041
n =	0.020

Velocity (V) 0.265 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.04

Channel Flow (Q) 166 l/sec

VxA

100 year peak discharge = 161 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 23	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 19				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	2956 l/s
S =	Longitudinal Slope	0.008 m/m
A =	Cross sectional area	3.137 m ²
P =	Wetted Perimeter	32.40 m
R =	Hydraulic Radius	0.097 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.008 m/m

Section Location Section 19

Depth =	0.33 m
Width =	16.00 m
S =	0.008 m/m
A =	3.137 m ²
P =	32.40 m
R =	0.097
n =	0.020

Velocity (V) 0.942 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.31

Channel Flow (Q) 2956 l/sec

VxA

100 year peak discharge = 2892 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 24	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 20				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	195 l/s
S =	Longitudinal Slope	0.006 m/m
A =	Cross sectional area	0.471 m ²
P =	Wetted Perimeter	13.46 m
R =	Hydraulic Radius	0.035 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.006 m/m

Section Location Section 20

Depth =	0.12 m
Width =	6.60 m
S =	0.006 m/m
A =	0.471 m ²
P =	13.46 m
R =	0.035
n =	0.020

Velocity (V) 0.414 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.05

Channel Flow (Q) 195 l/sec

VxA

100 year peak discharge = 174 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 25	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 21				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	2543 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	3.301 m ²
P=	Wetted Perimeter	32.43 m
R =	Hydraulic Radius	0.102 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.005 m/m

Section Location Section 21

Depth=	0.34 m
Width=	2.51 m
S=	0.005 m/m
A=	3.301 m ²
P=	32.43 m
R=	0.102
n=	0.020

Velocity (V) 0.770 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.26

Channel Flow (Q) 2543 l/sec

VxA

100 year peak discharge = 2511 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 26	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 22				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q = Channel Flow 44 l/s
S = Longitudinal Slope 0.005 m/m
A = Cross sectional area 0.184 m²
P = Wetted Perimeter 10.30 m
R = Hydraulic Radius 0.018 m
n = Mannings n 0.02

Longitudinal slope

S = 0.005 m/m

Section Location Section 22

Depth = 0.08 m
Width = 5.10 m
S = 0.005 m/m
A = 0.184 m²
P = 10.30 m
R = 0.018
n = 0.020

Velocity (V) 0.241 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.02

Channel Flow (Q) 44 l/sec
VxA

100 year peak discharge = 30 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 27	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 23				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	2075 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	2.92 m ²
P =	Wetted Perimeter	32.37 m
R =	Hydraulic Radius	0.090 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location Section 23

Depth =	0.32 m
Width =	16.00 m
S =	0.005 m/m
A =	2.92 m ²
P =	32.37 m
R =	0.090
n =	0.020

Velocity (V) 0.711 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.23

Channel Flow (Q) 2075 l/sec

VxA

100 year peak discharge = 1966 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 28	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 24				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	449 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.696 m ²
P =	Wetted Perimeter	8.92 m
R =	Hydraulic Radius	0.078035654 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location 24

Depth =	0.15 m
Width =	8.66 m
S =	0.005 m/m
A =	0.696 m ²
P =	8.92 m
R =	0.078
n =	0.020

Velocity (V) 0.645 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.10

Channel Flow (Q) 449 l/sec

VxA

100 year peak discharge = 427 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 29	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 25				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	1521 l/s
S =	Longitudinal Slope	0.008 m/m
A =	Cross sectional area	1.485 m ²
P=	Wetted Perimeter	13.53 m
R =	Hydraulic Radius	0.109723659 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.008 m/m

Section Location 25

Depth=	0.22 m
Width=	13.27 m
S=	0.008 m/m
A=	1.485 m ²
P=	13.53 m
R=	0.110
n=	0.020

Velocity (V) 1.024 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.23

Channel Flow (Q) 1521 l/sec

VxA

100 year peak discharge = 1503 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 30	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 26				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	67 l/s
S =	Longitudinal Slope	0.014 m/m
A =	Cross sectional area	0.12 m ²
P=	Wetted Perimeter	4.12 m
R =	Hydraulic Radius	0.029097963 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.014 m/m

Section Location 26

Depth=	0.06 m
Width=	4.00 m
S=	0.014 m/m
A=	0.12 m ²
P=	4.12 m
R=	0.029
n=	0.020

Velocity (V) 0.559 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.03

Channel Flow (Q) 67 l/sec

VxA

100 year peak discharge = 43 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 31	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 27				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where Q= Channel Flow 1504 l/s
S = Longitudinal Slope 0.008 m/m
A = Cross sectional area 1.474 m²
P = Wetted Perimeter 13.51 m
R = Hydraulic Radius 0.109104367 m
n = Mannings n 0.02

Longitudinal slope

S= **0.008** m/m

Section Location 27

Depth= 0.22 m
Width= 13.20 m
S= 0.008 m/m
A= 1.474 m²
P= 13.51 m
R= 0.109
n= 0.020

Velocity (V) 1.020 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.22

Channel Flow (Q) **1504** l/sec
VxA

100 year peak discharge = 1459 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 32	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 28				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	391 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.613 m ²
P =	Wetted Perimeter	7.99 m
R =	Hydraulic Radius	0.076759329 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location 28

Depth =	0.14 m
Width =	7.72 m
S =	0.005 m/m
A =	0.613 m ²
P =	7.99 m
R =	0.077
n =	0.020

Velocity (V) 0.638 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.09

Channel Flow (Q) 391 l/sec

VxA

100 year peak discharge = 383 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 33	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 29				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where Q= Channel Flow 1012 l/s
S = Longitudinal Slope 0.007 m/m
A = Cross sectional area 1.141 m²
P = Wetted Perimeter 11.67 m
R = Hydraulic Radius 0.097797206 m
n = Mannings n 0.02

Longitudinal slope

S= **0.007** m/m

Section Location 29

Depth= 0.2 m
Width= 11.40 m
S= 0.007 m/m
A= 1.141 m²
P= 11.67 m
R= 0.098
n= 0.020

Velocity (V) 0.887 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.18

Channel Flow (Q) **1012** l/sec
VxA

100 year peak discharge = 1008 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 34	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 30				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	423 l/s
S =	Longitudinal Slope	0.008 m/m
A =	Cross sectional area	0.525 m ²
P =	Wetted Perimeter	6.87 m
R =	Hydraulic Radius	0.076474873 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.008 m/m

Section Location 30

Depth =	0.13 m
Width =	6.60 m
S =	0.008 m/m
A =	0.525 m ²
P =	6.87 m
R =	0.076
n =	0.020

Velocity (V) 0.805 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.10

Channel Flow (Q) 423 l/sec

VxA

100 year peak discharge = 372 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 35	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 31				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where Q= Channel Flow 299 l/s
S = Longitudinal Slope 0.008 m/m
A = Cross sectional area 0.426 m²
P = Wetted Perimeter 6.84 m
R = Hydraulic Radius 0.062326262 m
n = Mannings n 0.02

Longitudinal slope

S= **0.008** m/m

Section Location 31

Depth= 0.13 m
Width= 6.60 m
S= 0.008 m/m
A= 0.525 m²
P= 6.84 m
R= 0.062
n= 0.020

Velocity (V) 0.702 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.08

Channel Flow (Q) **423** l/sec
VxA

100 year peak discharge = 372 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 36	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 32				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q= Channel Flow 448 l/s
S = Longitudinal Slope 0.009 m/m
A = Cross sectional area 0.525 m²
P = Wetted Perimeter 6.87 m
R = Hydraulic Radius 0.076474873 m
n = Mannings n 0.02

Longitudinal slope

S= 0.009 m/m

Section Location 32

Depth= 0.13 m
Width= 6.60 m
S= 0.009 m/m
A= 0.525 m²
P= 6.87 m
R= 0.076
n= 0.020

Velocity (V) 0.854 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.11

Channel Flow (Q) 448 l/sec
VxA

100 year peak discharge = 372 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 37	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 33				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	140 l/s
S =	Longitudinal Slope	0.009 m/m
A =	Cross sectional area	0.246 m ²
P =	Wetted Perimeter	5.91 m
R =	Hydraulic Radius	0.041610284 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.009 m/m

Section Location 33

Depth =	0.08 m
Width =	5.74 m
S =	0.009 m/m
A =	0.246 m ²
P =	5.91 m
R =	0.042
n =	0.020

Velocity (V) 0.569 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.05

Channel Flow (Q) 140 l/sec

VxA

100 year peak discharge = 119 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 38	Rev A
Job Title Clevedon Meadows		Author ML	Date 15/11/2024	Checked JD
Calc Title Proposed Overland Flowpath - Section 34				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	155 l/s
S =	Longitudinal Slope	0.011 m/m
A =	Cross sectional area	0.246 m ²
P =	Wetted Perimeter	5.91 m
R =	Hydraulic Radius	0.041610284 m
n =	Mannings n	0.02

Longitudinal slope

S = **0.011** m/m

Section Location 34

Depth =	0.09 m
Width =	5.94 m
S =	0.011 m/m
A =	0.246 m ²
P =	5.91 m
R =	0.042
n =	0.020

Velocity (V) 0.629 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.06

Channel Flow (Q) **155** l/sec

VxA

100 year peak discharge = 119 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 39	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 35				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	2148 l/s
S =	Longitudinal Slope	0.003 m/m
A =	Cross sectional area	3.478 m ²
P=	Wetted Perimeter	32.43 m
R =	Hydraulic Radius	0.107 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.003 m/m

Section Location Section 35

Depth=	0.35 m
Width=	16.00 m
S=	0.003 m/m
A=	3.478 m ²
P=	32.43 m
R=	0.107
n=	0.020

Velocity (V) 0.618 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.22

Channel Flow (Q) 2148 l/sec

VxA

100 year peak discharge = 2122 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 40	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 36		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	2476 l/s
S =	Longitudinal Slope	0.009 m/m
A =	Cross sectional area	1.381 m ²
P=	Wetted Perimeter	5.94 m
R =	Hydraulic Radius	0.233 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.009 m/m

Section Location Section 36

Depth=	0.39 m
Width=	5.85 m
S=	0.009 m/m
A=	1.381 m ²
P=	5.94 m
R=	0.233
n=	0.020

Velocity (V) 1.793 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.70

Channel Flow (Q) 2476 l/sec

VxA

100 year peak discharge = 2417 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 41	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 36 A		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

Q= $(AR^{2/3}S^{1/2})/n$
R=A/P

Where Q= Channel Flow 334 l/s
S = Longitudinal Slope 0.005 m/m
A = Cross sectional area 0.525 m²
P= Wetted Perimeter 6.86 m
R = Hydraulic Radius 0.076 m
n = Mannings n 0.02

Longitudinal slope

S= **0.005** m/m

Section Location Section 36A

Depth= 0.15 m
Width= 0.12 m
S= 0.005 m/m
A= 0.525 m²
P= 6.86 m
R= 0.076
n= 0.020

Velocity (V) 0.637 m/sec
 $R(2/3) S(1/2)/ n$

Depth x Velocity (D.V) 0.19

Channel Flow (Q) **334** l/sec
VxA

100 year peak discharge = 297 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 42	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 37				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	1841 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	2.717 m ²
P=	Wetted Perimeter	32.34 m
R =	Hydraulic Radius	0.084 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.005 m/m

Section Location Section 37

Depth=	0.3 m
Width=	15.84 m
S=	0.005 m/m
A=	2.717 m ²
P=	32.34 m
R=	0.084
n=	0.020

Velocity (V) 0.678 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.20

Channel Flow (Q) 1841 l/sec

VxA

100 year peak discharge = 1828 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 43	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 38				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	1790 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	2.66 m ²
P =	Wetted Perimeter	31.99 m
R =	Hydraulic Radius	0.083 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location Section 38

Depth =	0.26 m
Width =	15.80 m
S =	0.005 m/m
A =	2.66 m ²
P =	31.99 m
R =	0.083
n =	0.020

Velocity (V) 0.673 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.17

Channel Flow (Q) 1790 l/sec

VxA

100 year peak discharge = 1746 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 44	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 39		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q= Channel Flow 344 l/s
S = Longitudinal Slope 0.008 m/m
A = Cross sectional area 0.665 m²
P = Wetted Perimeter 16.86 m
R = Hydraulic Radius 0.039 m
n = Mannings n 0.02

Longitudinal slope

S= 0.008 m/m

Section Location Section 39

Depth= 0.15 m
Width= 8.24 m
S= 0.008 m/m
A= 0.665 m²
P= 16.86 m
R= 0.039
n= 0.020

Velocity (V) 0.518 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.08

Channel Flow (Q) 344 l/sec
VxA

100 year peak discharge = 341 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 45	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 40				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	305 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.728 m ²
P=	Wetted Perimeter	17.80 m
R =	Hydraulic Radius	0.041 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.005 m/m

Section Location Section 40

Depth=	0.16 m
Width=	8.80 m
S=	0.005 m/m
A=	0.728 m ²
P=	17.80 m
R=	0.041
n=	0.020

Velocity (V) 0.419 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.07

Channel Flow (Q) 305 l/sec

VxA

100 year peak discharge = 293 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 46	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 41		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	242 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	0.567 m ²
P=	Wetted Perimeter	13.47 m
R =	Hydraulic Radius	0.042 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.005 m/m

Section Location Section 41

Depth=	0.13 m
Width=	7.26 m
S=	0.005 m/m
A=	0.567 m ²
P=	13.47 m
R=	0.042
n=	0.020

Velocity (V) 0.427 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.06

Channel Flow (Q) 242 l/sec

VxA

100 year peak discharge = 235 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 47	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 42				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q =	Channel Flow	574 l/s
S =	Longitudinal Slope	0.005 m/m
A =	Cross sectional area	1.114 m ²
P =	Wetted Perimeter	20.00 m
R =	Hydraulic Radius	0.056 m
n =	Mannings n	0.02

Longitudinal slope

S = 0.005 m/m

Section Location Section 42

Depth =	0.20 m
Width =	9.89 m
S =	0.005 m/m
A =	1.114 m ²
P =	20.00 m
R =	0.056
n =	0.020

Velocity (V) 0.515 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.28

Channel Flow (Q) 574 l/sec

VxA

100 year peak discharge = 548 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 48	Rev A
Job Title Clevedon Meadows Calc Title Mannings Calculations - Section 43		Author ML	Date 15/11/2024	Checked JD

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q= Channel Flow 635 l/s
S = Longitudinal Slope 0.010 m/m
A = Cross sectional area 1 m²
P = Wetted Perimeter 22.06 m
R = Hydraulic Radius 0.045 m
n = Mannings n 0.02

Longitudinal slope

S= **0.010** m/m

Section Location Section 43

Depth= 0.18 m
Width= 10.91 m
S= 0.010 m/m
A= 1 m²
P= 22.06 m
R= 0.045
n= 0.020

Velocity (V) 0.635 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.11

Channel Flow (Q) **635** l/sec
VxA

100 year peak discharge = 605 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 49	Rev A
Job Title Clevedon Meadows	Author ML	Date 15/11/2024	Checked JD	
Calc Title Mannings Calculations - Section 44				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where

Q=	Channel Flow	753 l/s
S =	Longitudinal Slope	0.017 m/m
A =	Cross sectional area	0.929 m ²
P=	Wetted Perimeter	21.16 m
R =	Hydraulic Radius	0.044 m
n =	Mannings n	0.02

Longitudinal slope

S= 0.017 m/m

Section Location Section 44

Depth=	0.17 m
Width=	10.46 m
S=	0.017 m/m
A=	0.929 m ²
P=	21.16 m
R=	0.044
n=	0.020

Velocity (V) 0.810 m/sec

$R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.14

Channel Flow (Q) 753 l/sec

VxA

100 year peak discharge = 743 l/sec OK

* Refer TP108 Modelling for Flow rates

 MAVEN ASSOCIATES		Job Number 194006	Sheet 50	Rev A
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Calc Title Mannings Calculations - Section 45				

Design Spreadsheet for Mannings Formula

Calc 1: Capacity of Channel Flow (Q), Mannings formula

$Q = \frac{(AR^{2/3}S^{1/2})}{n}$
 $R = A/P$

Where
Q= Channel Flow 3266 l/s
S = Longitudinal Slope 0.017 m/m
A = Cross sectional area 2.595 m²
P = Wetted Perimeter 30.56 m
R = Hydraulic Radius 0.085 m
n = Mannings n 0.02

Longitudinal slope

S= **0.017** m/m

Section Location Section 45

Depth= 0.13 m
Width= 30.53 m
S= 0.017 m/m
A= 2.595 m²
P= 30.56 m
R= 0.085
n= 0.020

Velocity (V) 1.259 m/sec
 $R(2/3) S(1/2) / n$

Depth x Velocity (D.V) 0.16

Channel Flow (Q) **3266** l/sec
VxA

100 year peak discharge = 3201 l/sec OK

* Refer TP108 Modelling for Flow rates