FINAL STORMWATER REPORT

62,78,80 PAPAKURA-CLEVEDON ROAD

CLEVEDON

AUCKLAND

Maven Associates	**Job Number** 194006		**Rev** F
Job Title 62,78,80 Papakura-Clevedon Road **Title** Final Stormwater Report	**Author** ML	**Date** 09/03/2025	**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.

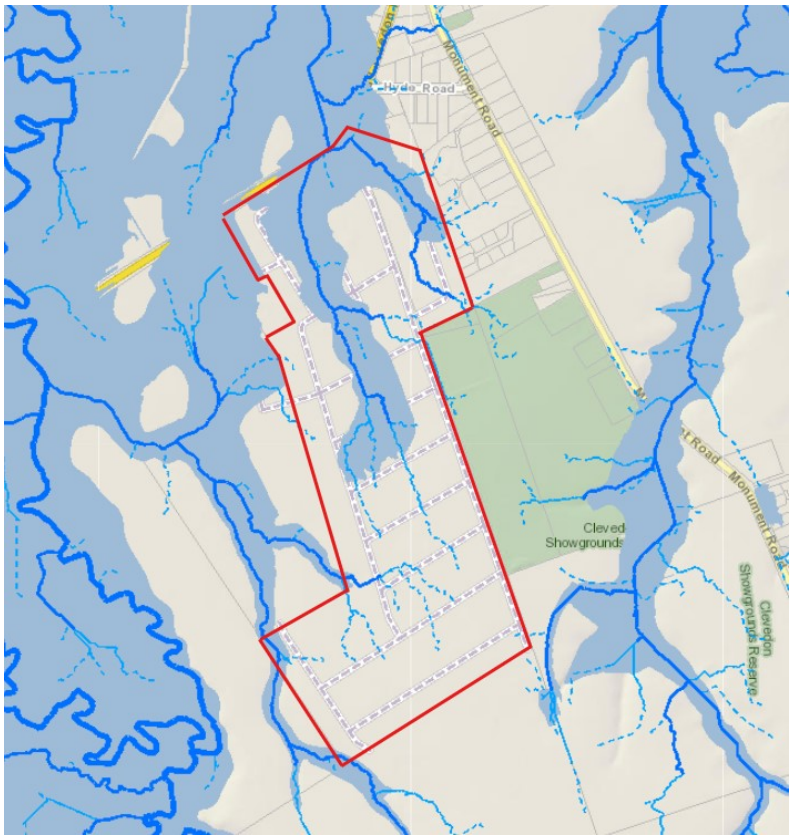


Figure 1: Existing 100-YR OLFP and Floodplains

1.3 RESOURCE CONSENT

The consented development at 62, 78 & 80 Papakura Clevedon Road is subject to conditions contained within Consent BUN60399307. Condition 22 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

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
Roads	70/30	90.8
Lots	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

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. Vehicle crossings off the carriageways will be ramped to access lot dwellings. It is anticipated that all units will also have a minimum stepdown of 225mm. This ensures adequate freeboard compliance.

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 $2m^3/s$	◦ 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 $2m^3/s$	◦ 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

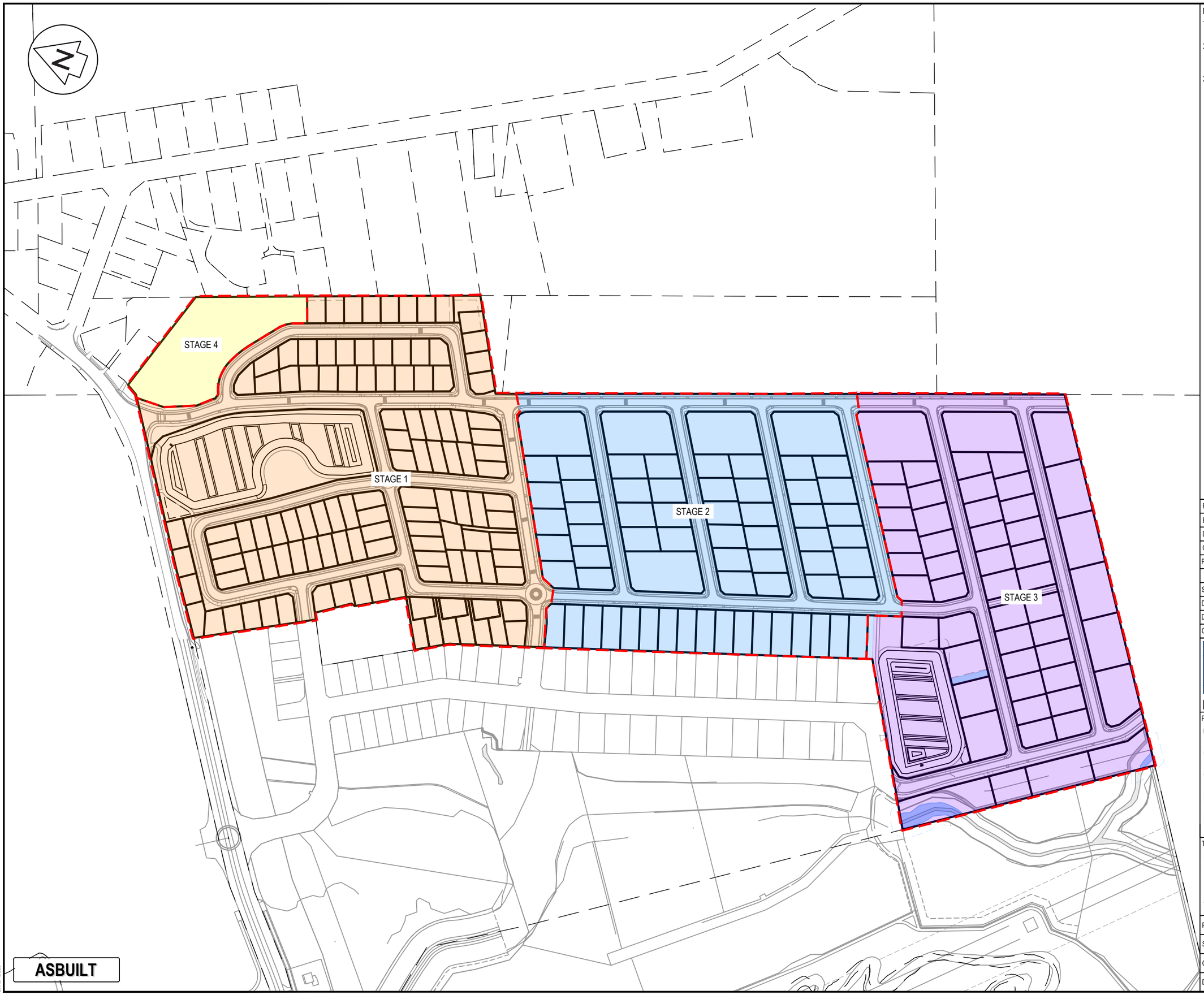
Figure 2: AUP – OP Freeboard Requirements

2.3 Wetland A inlet spillway

To mitigate backflow effects from downstream at Papakura-Clevedon Road, the overland flow inlet discharge into Wetland A has been constructed at a higher level than the finished levels of Road 3 (Kakano Street). Consequently, a ponding area has been designated at the sag point of Road 3. The base level of the wetland inlet spillway has been constructed at 7.84m RL, which serves as the ponding level for the surrounding area.

A weir calculation has been carried out to determine the flood level of the overland flow entering Wetland A, resulting in a flood RL of 8.05m RL (**Appendix D**). Considering the extent of the ponding area, this flood level has been applied to lots 74-79. By incorporating a 500mm freeboard requirement, the minimum floor level for these lots has been set at 8.55m RL.

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.

STAGE 1
STAGE 2
STAGE 3
STAGE 4

Legend

PR BOUNDARY
EX BOUNDARY
STAGING BOUNDARY

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

	By	Date
Survey	-	-
Design	ML	11/2024
Drawn	ML	11/2024
Checked	JD	11/2024

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

Project

62, 78 & 80 PAPAKURA - 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-BUILT.DWG		
Drawing no.	C462	Rev	F

ASBUILT

DATE: 3/25

EX CATCHMENT B
AREA = 1.40ha
Q_{100}FLOW = 0.636m^3/s

EX CATCHMENT C
AREA = 2.58ha
Q_{100}FLOW = 1.158m^3/s

EX CATCHMENT D
AREA = 2.69ha
Q_{100}FLOW = 1.074m^3/s

EX CATCHMENT A
AREA = 1.24ha
Q_{100}FLOW = 0.563m^3/s

EX CATCHMENT F
AREA = 1.06ha
Q_{100}FLOW = 0.563m^3/s

PR CATCHMENT C
AREA = 1.71ha
Q_{100}FLOW = 0.780m^3/s

EX CATCHMENT E
AREA = 1.78ha
Q_{100}FLOW = 0.701m^3/s

PR CATCHMENT A
AREA = 0.22ha
Q_{100}FLOW = 0.101m^3/s

PR CATCHMENT B
AREA = 1.81ha
Q_{100}FLOW = 0.709m^3/s

PR CATCHMENT E
AREA = 4.89ha
Q_{100}FLOW = 2.968m^3/s

Q_{100}FLOW = 4.267m^3/s

Q_{100}FLOW = 3.558m^3/s

PR CATCHMENT D
AREA = 9.62ha
Q_{100}FLOW = 3.558m^3/s

PR CATCHMENT F
AREA = 5.26ha
Q_{100}FLOW = 2.417m^3/s

PR CATCHMENT G
AREA = 1.74ha
Q_{100}FLOW = 0.693m^3/s

PR CATCHMENT H
AREA = 1.76ha
Q_{100}FLOW = 0.743m^3/s

Q_{100}FLOW = 3.201m^3/s

ASBUILT

DATE: 3/25

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Legend
- PR BOUNDARY
- EX BOUNDARY
- STAGING BOUNDARY
- AB OLFP FLOW

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

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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 PAPAKURA - CLEVEDON ROAD, CLEVEDON, AUCKLAND FOR CLEVEDON PROPERTOES LTD

Title
BUN60399307 AS-BUILT 100-YEAR OLFP CATCHMENT PLAN

Project no.	194006		
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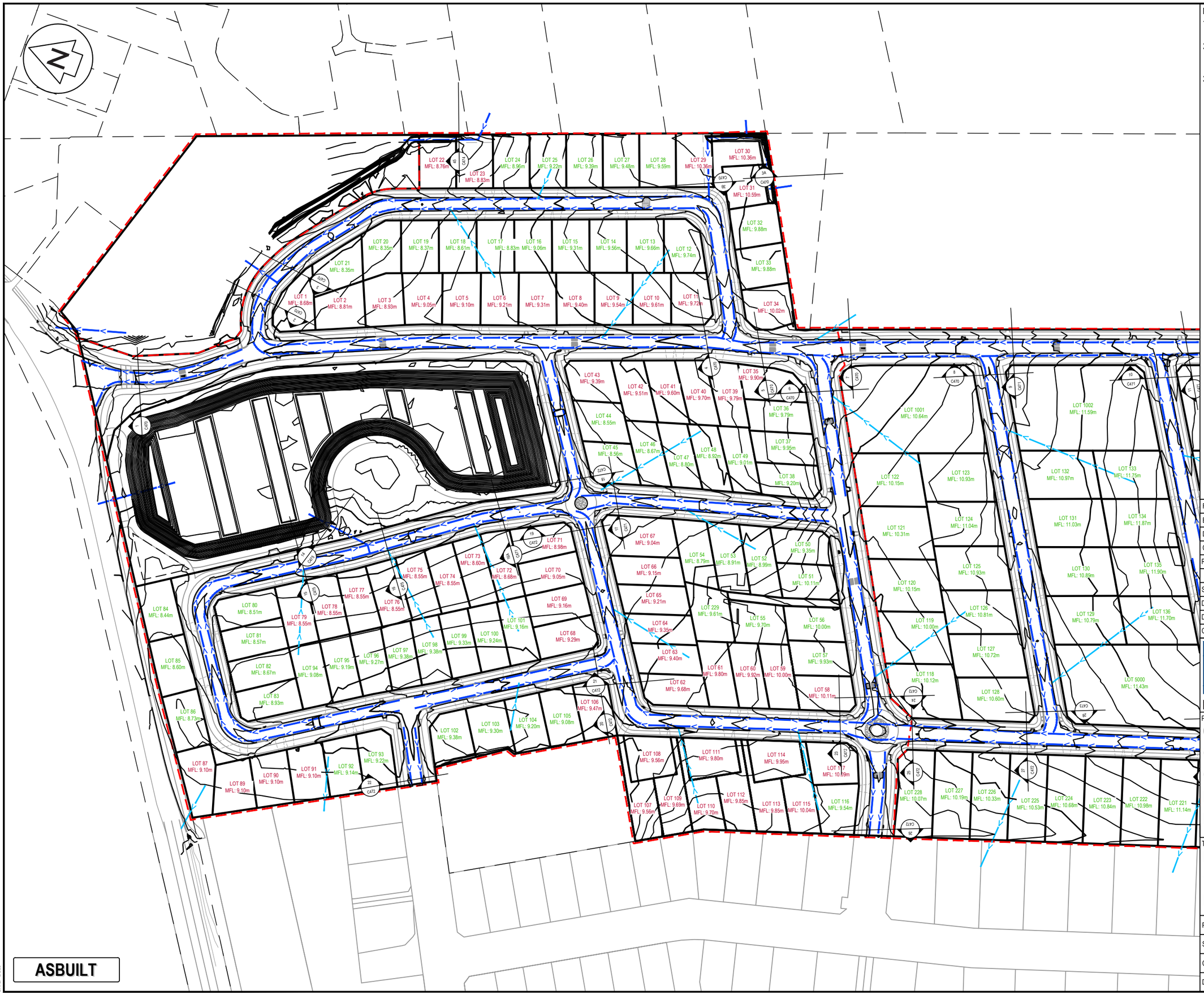
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG		
Drawing no.	C463	Rev	F



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

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
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Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

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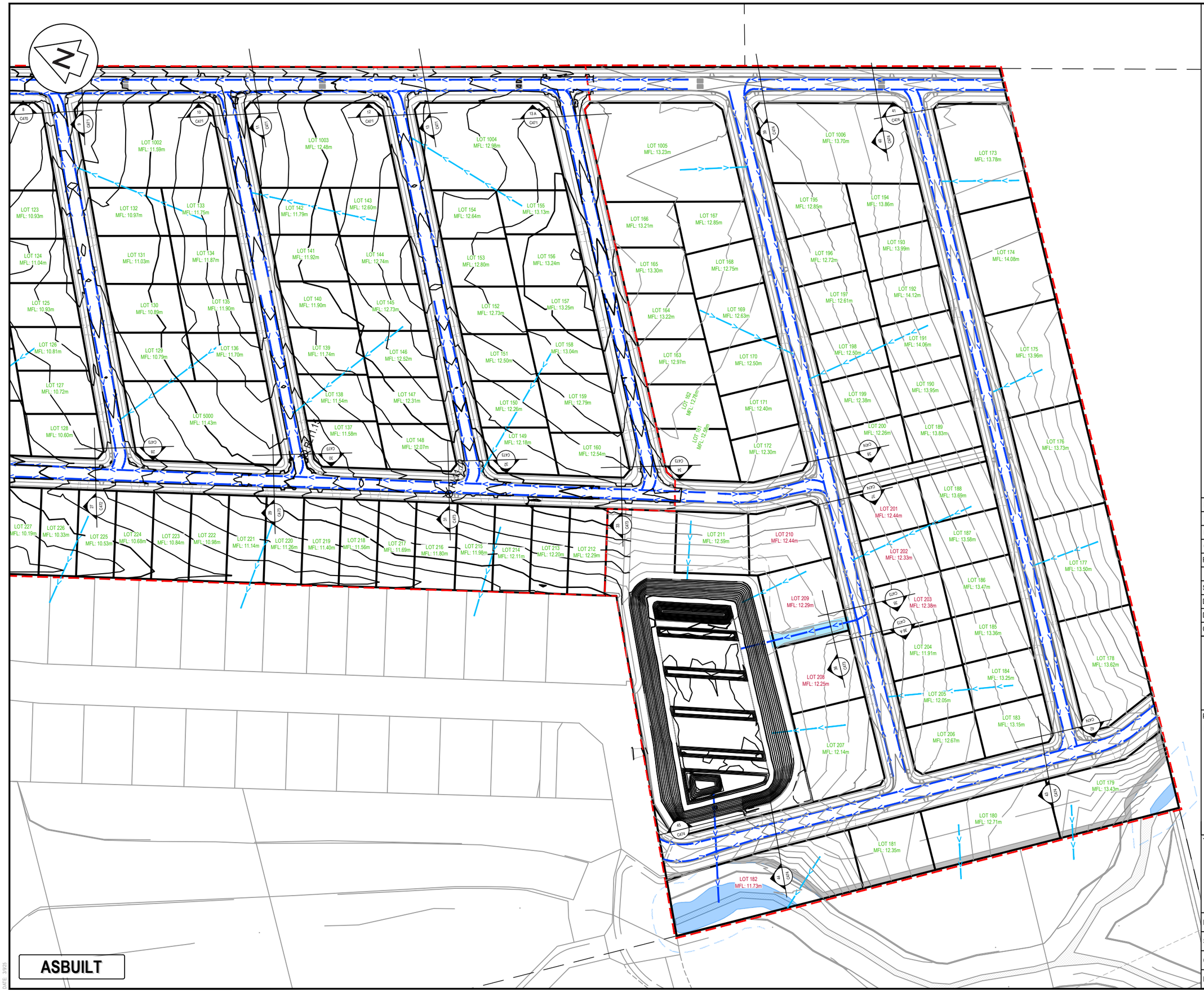
Title

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	F

DATE: 3/9/25



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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)

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
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09 571 0050
info@maven.co.nz
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Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG		
Drawing no.	C465	Rev	F

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ASBUILT

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

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
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MAVEN

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

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

Title

BUN60399307 AS-BUILT 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	F

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)

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

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

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

Title

BUN60399307 AS-BUILT 100-YEAR FLOOD EXTENT PLAN

Project no.	194006
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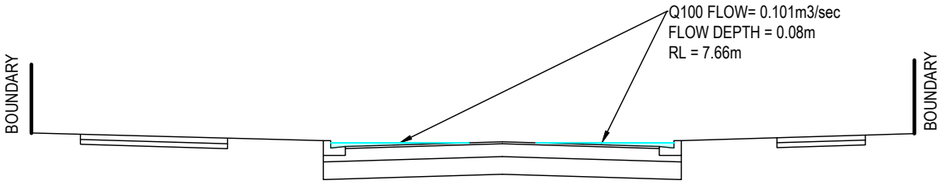
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C467 Rev F

DATE: 3/25



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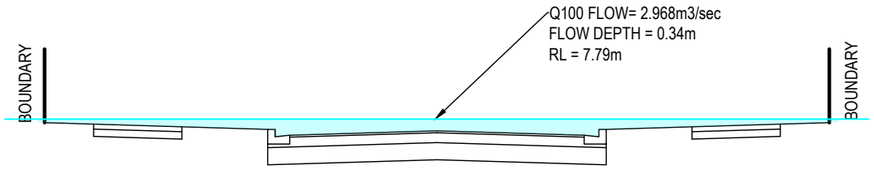

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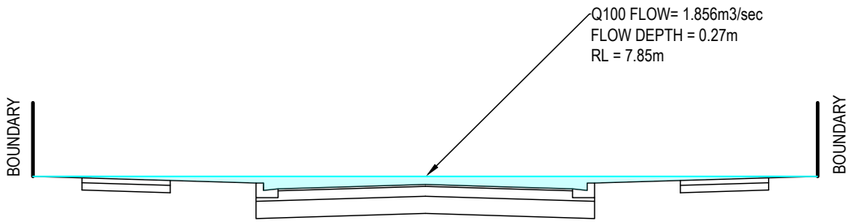

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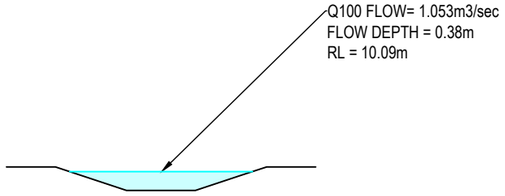

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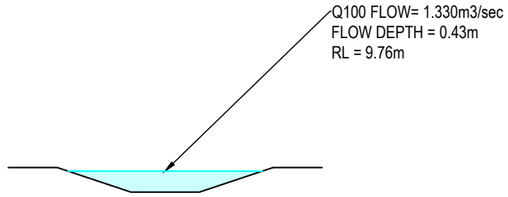
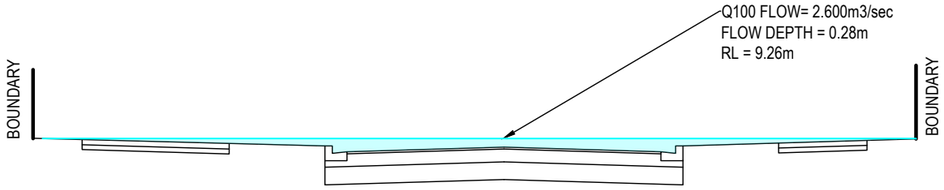


SECTION 3B - SWALE



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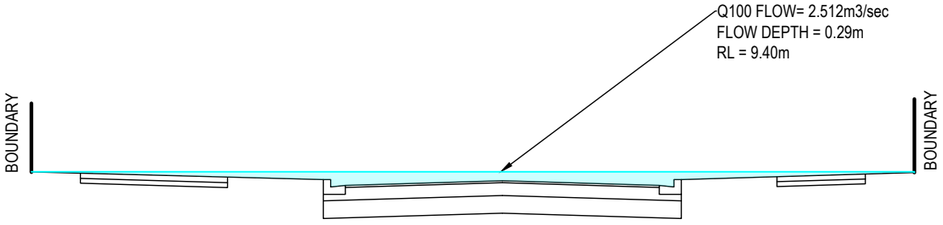

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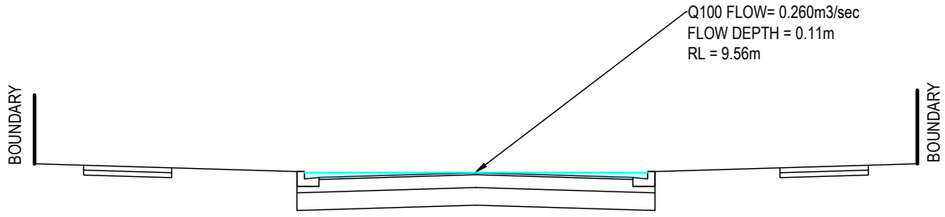

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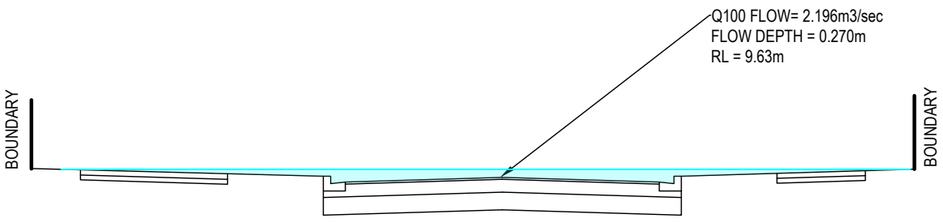
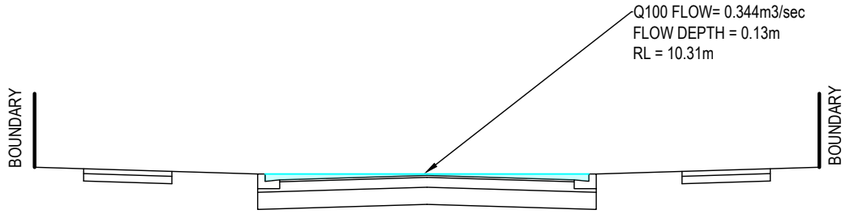


SECTION 7- ROAD 1



SECTION 8 - ROAD 7

ASBUILT

DATE 3/025

Notes

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Legend

100-YR FLOOD EXTENT

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

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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 PAPAKURA - CLEVEDON ROAD, CLEVEDON, AUCKLAND FOR CLEVEDON PROPERTOES LTD

Title

BUN60399307 AS-BUILT 100-YEAR OLFP SECTIONS

Project no.	194006
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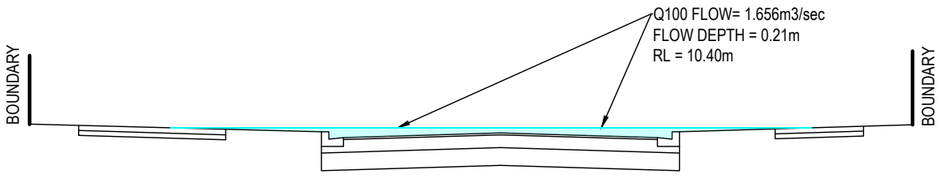
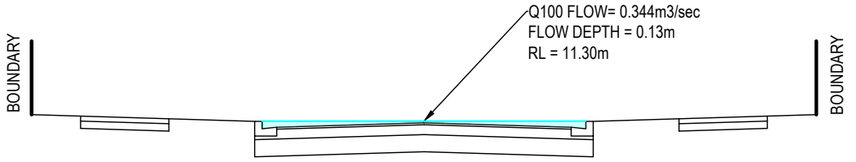
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C470 Rev F



SECTION 9 - ROAD 1



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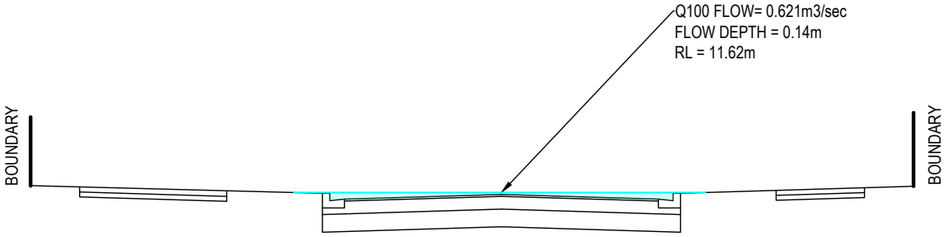

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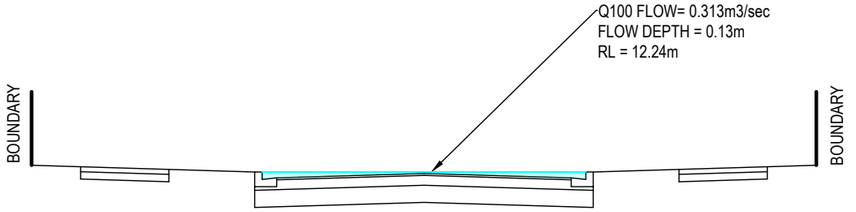

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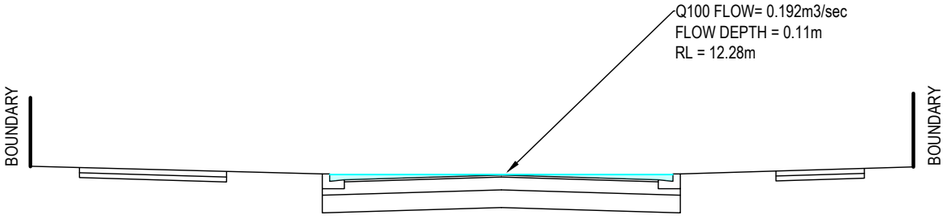

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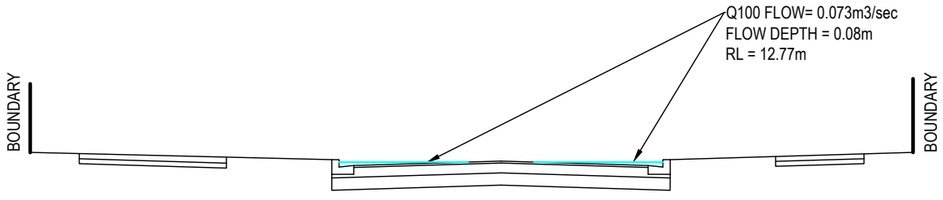
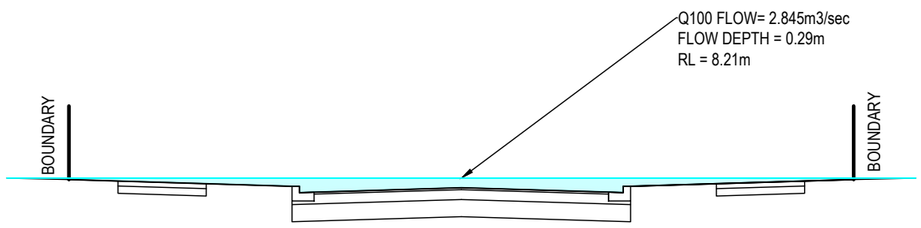
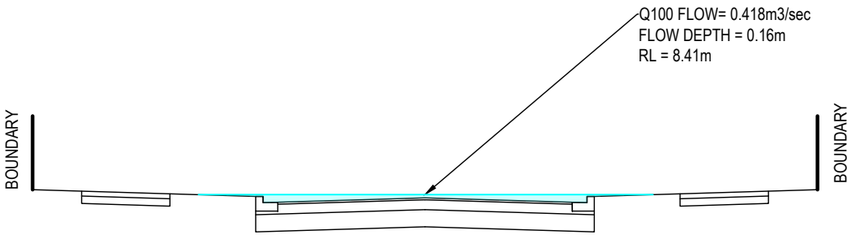


SECTION 13A - ROAD 10



SECTION 16A - ROAD 3



SECTION 17 - ROAD 3

ASBUILT

DATE 3/025

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

100-YR FLOOD EXTENT

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

	By	Date
Survey	-	-
Design	ML	11/2024
Drawn	ML	11/2024
Checked	JD	11/2024

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

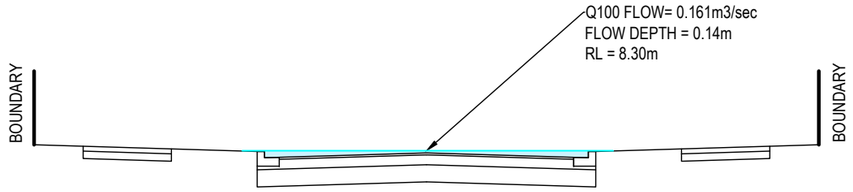
Project

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

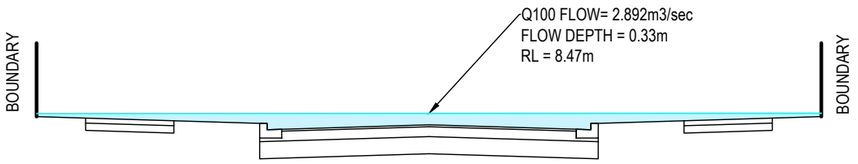
Title

BUN60399307 AS-BUILT FLOOD ASSESSMENT PLAN

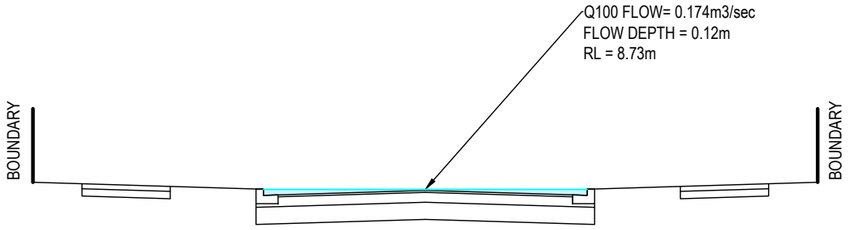
Project no.	194006
Scale	1:125 @ A3
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C471 Rev F



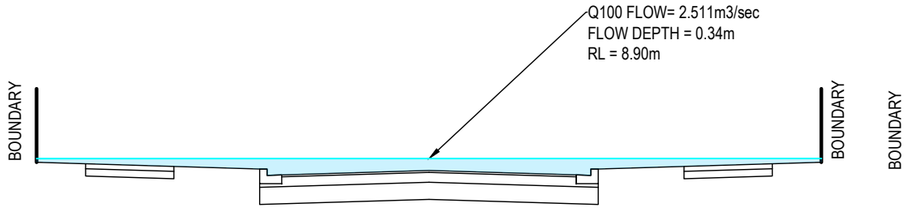
SECTION 18 - ROAD 4



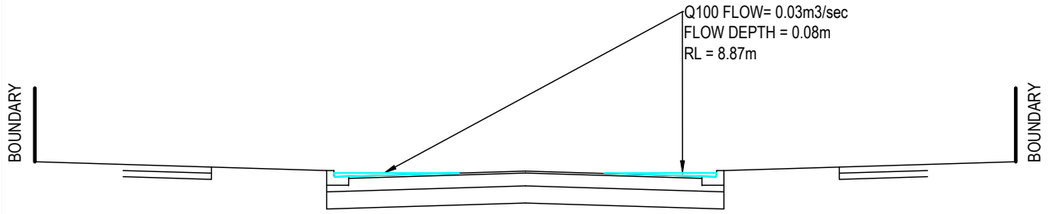
SECTION 19 - ROAD 4



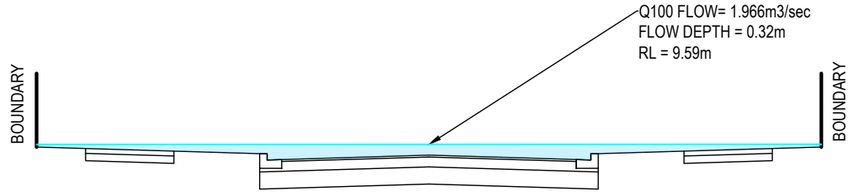
SECTION 20 - ROAD 3



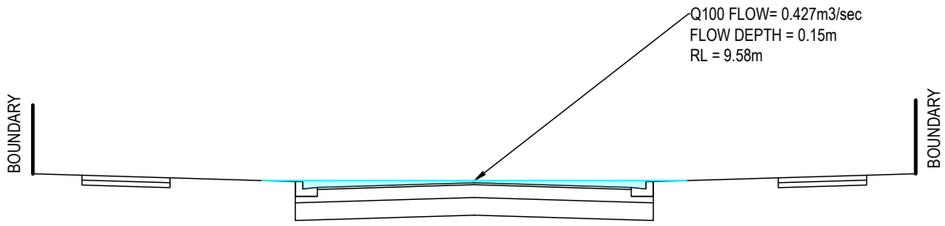
SECTION 21 - ROAD 4



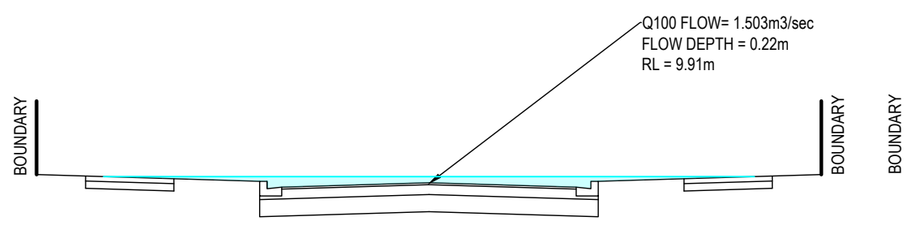
SECTION 22 - ROAD 5



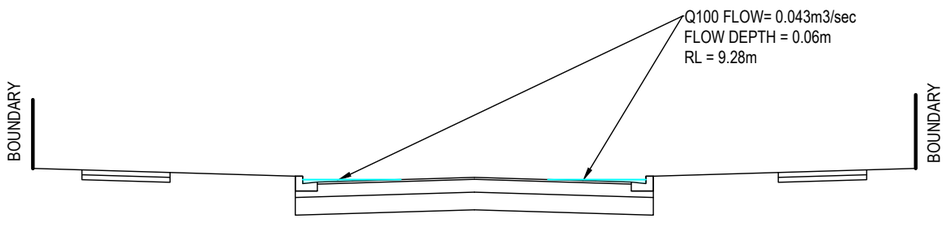
SECTION 23 - ROAD 4



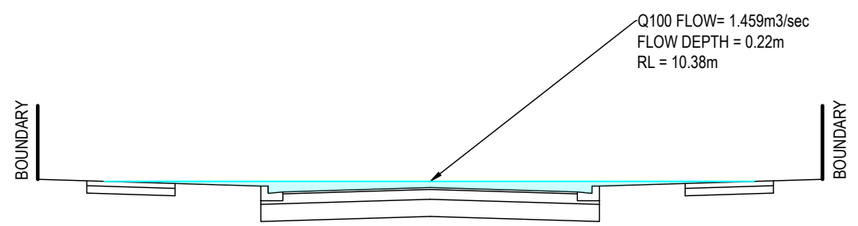
SECTION 24 - ROAD 6



SECTION 25 - ROAD 4



SECTION 26- ROAD 4



SECTION 27 - ROAD 4

ASBUILT

DATE 3/9/25

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

100-YR FLOOD EXTENT

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

	By	Date
Survey	-	-
Design	ML	11/2024
Drawn	ML	11/2024
Checked	JD	11/2024

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

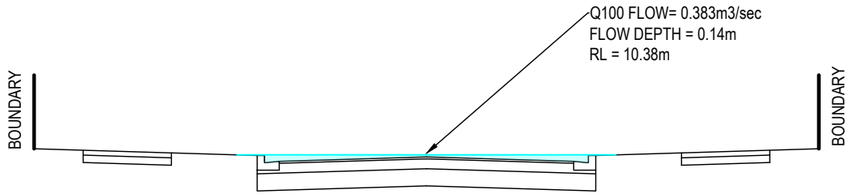
Project

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

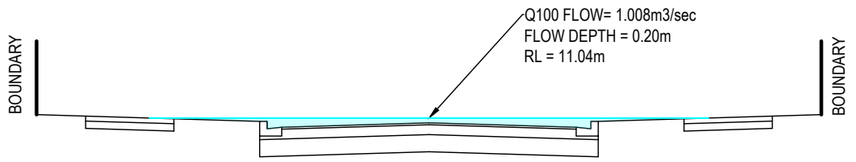
Title

BUN60399307 AS-BUILT FLOOD ASSESSMENT PLAN

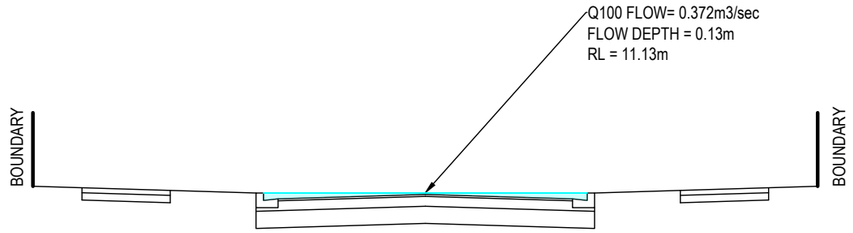
Project no.	194006
Scale	1:125 @ A3
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG
Drawing no.	C472 Rev F



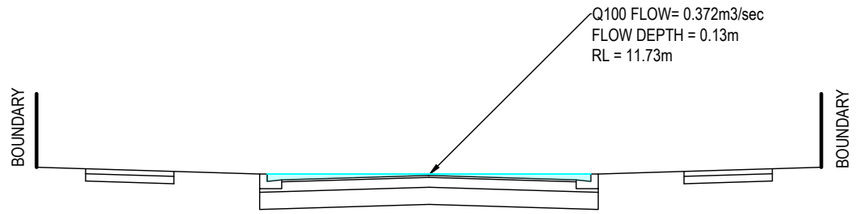
SECTION 28 - ROAD 7



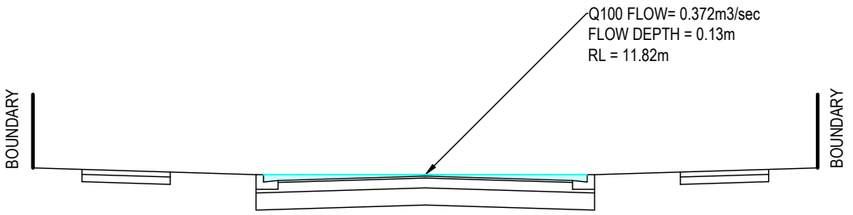
SECTION 29 - ROAD 4



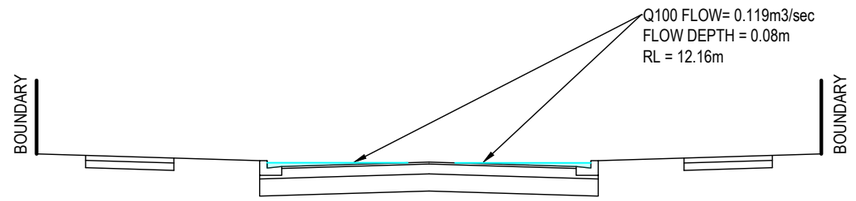
SECTION 30 - ROAD 8



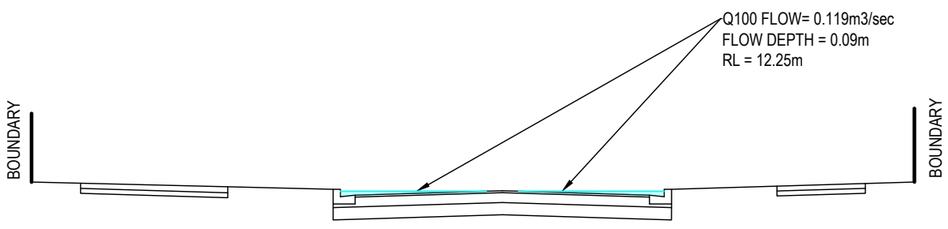
SECTION 31 - ROAD 4



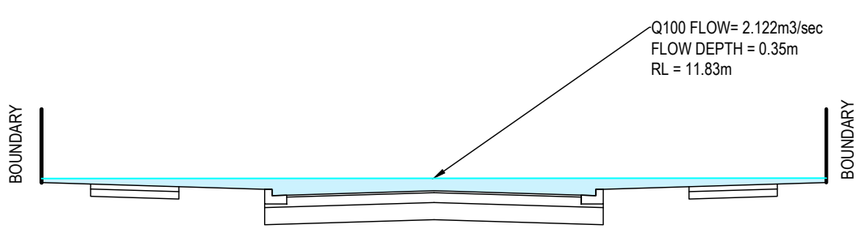
SECTION 32 - ROAD 9



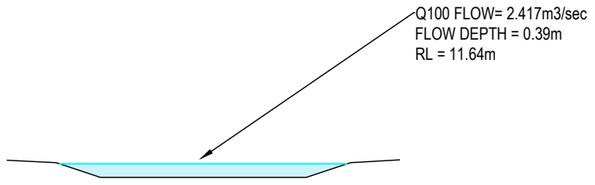
SECTION 33 - ROAD 4



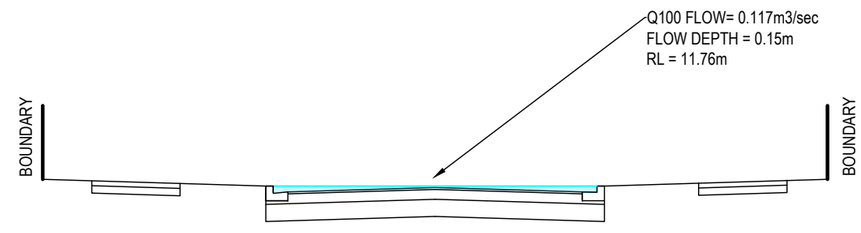
SECTION 34 - ROAD 10



SECTION 35 - ROAD 11



SECTION 36 - SWALE



SECTION 36A - ROAD 11

ASBUILT

DATE: 3/9/25

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

100-YR FLOOD EXTENT

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

	By	Date
Survey	-	-
Design	ML	11/2024
Drawn	ML	11/2024
Checked	JD	11/2024

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

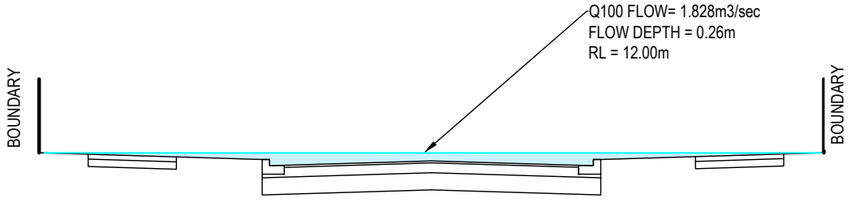
Project

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

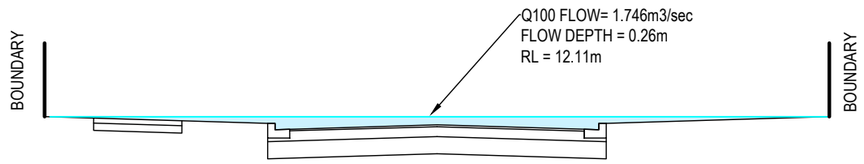
Title

BUN60399307 AS-BUILT 100-YEAR OLFP SECTIONS

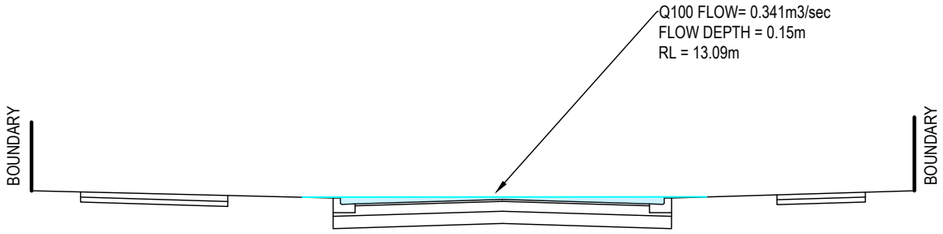
Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG		
Drawing no.	C473	Rev	F



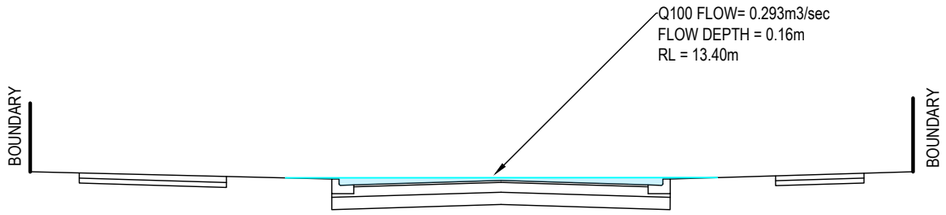
SECTION 37 - ROAD 11



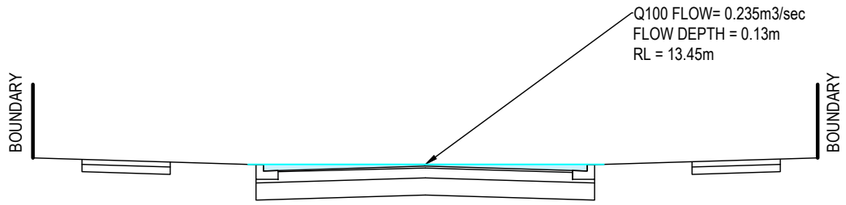
SECTION 38 - ROAD 11



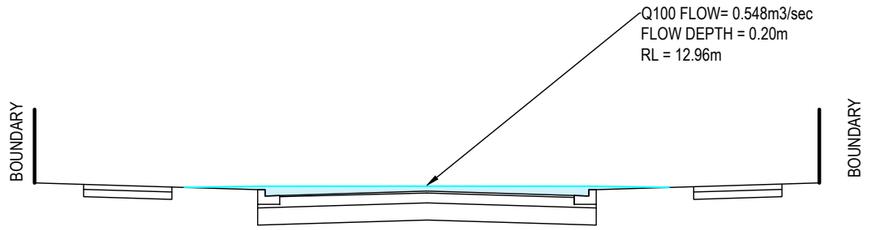
SECTION 39 - ROAD 1



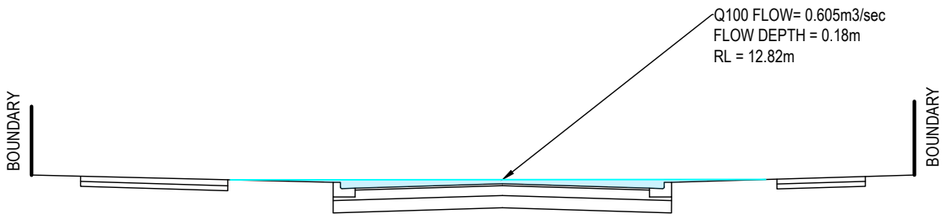
SECTION 40 - ROAD 1



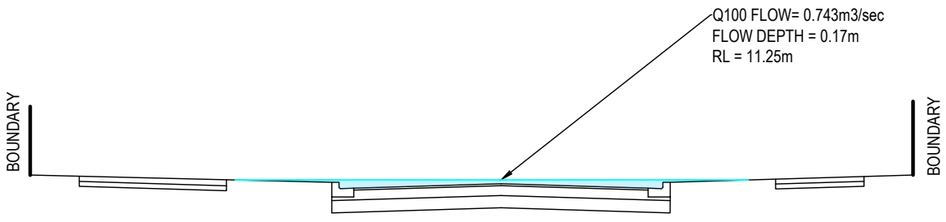
SECTION 41 - ROAD 12



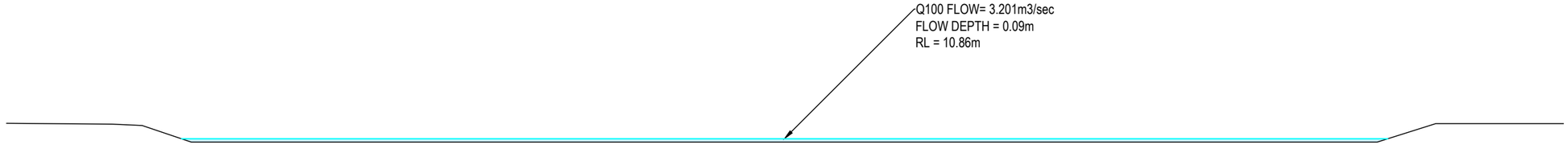
SECTION 42 - ROAD 12



SECTION 43 - ROAD 13



SECTION 44 - ROAD 13



SECTION 45

ASBUILT

DATE: 3/9/25

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

100-YR FLOOD EXTENT

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

	By	Date
Survey	-	-
Design	ML	11/2024
Drawn	ML	11/2024
Checked	JD	11/2024

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

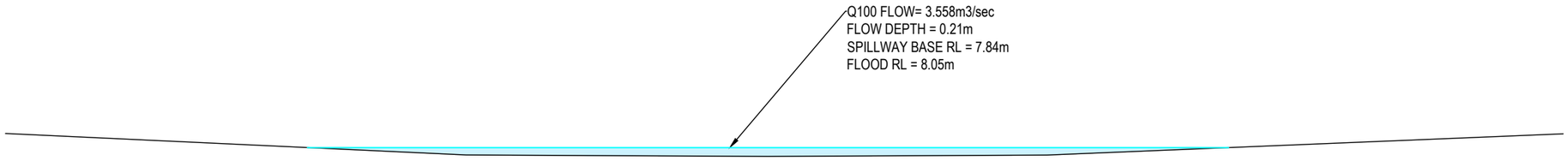
Project

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

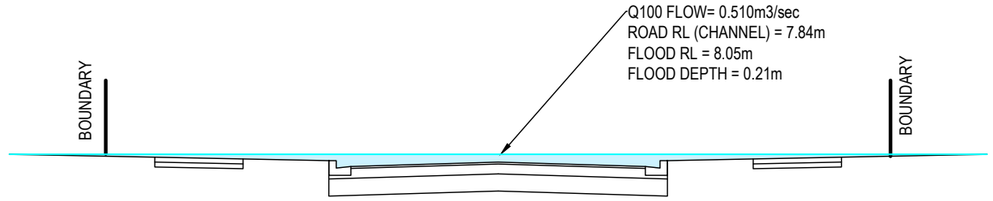
Title

BUN60399307 AS-BUILT 100-YEAR OLFP SECTIONS

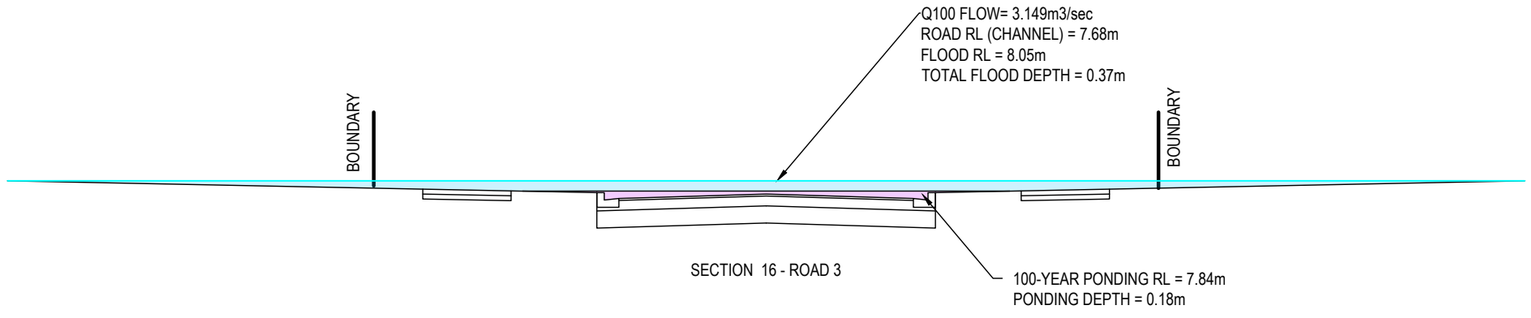
Project no.	194006		
Scale	1:125 @ A3		
Cad file	BUN60399307 - OVERLAND FLOW PATH AS-BUILT.DWG		
Drawing no.	C474	Rev	F



SECTION 14 - WETLAND A SPILLWAY



SECTION 15 - ROAD 3



SECTION 16 - ROAD 3

ASBUILT

DATE: 3/9/25

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

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
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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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Project

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Title

BUN60399307 AS-BUILT 100-YEAR OLFP SECTIONS

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

Stage 1

Lot	MFL (Consent Condition)	Final Flood Level	Freeboard Required	Final MFL (Minimum Floor Level)	Variation
1	8.44	8.18	0.50	8.68	0.24
2	8.57	8.31	0.50	8.81	0.24
3	8.67	8.43	0.50	8.93	0.26
4	8.76	8.55	0.50	9.05	0.29
5	8.85	8.60	0.50	9.10	0.25
6	8.95	8.71	0.50	9.21	0.26
7	9.40	8.81	0.50	9.31	-0.09
8	9.50	8.90	0.50	9.40	-0.10
9	9.60	9.04	0.50	9.54	-0.06
10	9.69	9.11	0.50	9.61	-0.08
11	9.79	9.22	0.50	9.72	-0.07
12	10.38	9.59	0.15	9.74	-0.64
13	10.17	9.51	0.15	9.66	-0.51
14	10.03	9.41	0.15	9.56	-0.47
15	9.85	9.16	0.15	9.31	-0.54
16	9.60	8.91	0.15	9.06	-0.54
17	9.35	8.68	0.15	8.83	-0.52
18	9.13	8.46	0.15	8.61	-0.52
19	8.93	8.22	0.15	8.37	-0.56
20	8.66	8.06	0.15	**8.35**	-0.31
21	8.14	7.91	0.15	**8.35**	0.21
22	9.02	8.26	0.50	8.76	-0.26
23	9.26	8.33	0.50	8.83	-0.43
24	9.50	8.81	0.15	8.96	-0.54
25	9.74	9.07	0.15	9.22	-0.52
26	9.96	9.24	0.15	9.39	-0.57
27	10.08	9.33	0.15	9.48	-0.60
28	10.19	9.44	0.15	9.59	-0.60
29	10.27	9.86	0.50	10.36	0.09
30	10.30	9.86	0.50	10.36	0.06
31	10.30	10.09	0.50	10.59	0.29
32	10.41	9.73	0.15	9.88	-0.53
33	9.87	9.73	0.15	9.88	0.01
34	10.22	9.52	0.50	10.02	-0.20
35	10.02	9.40	0.50	9.90	-0.12
36	10.01	9.64	0.15	9.79	-0.22
37	10.16	9.80	0.15	9.95	-0.21
38	10.23	9.05	0.15	9.20	-1.03
39	9.89	9.29	0.50	9.79	-0.10
40	9.80	9.20	0.50	9.70	-0.10
41	9.73	9.10	0.50	9.60	-0.13
42	9.65	9.01	0.50	9.51	-0.14
43	9.56	8.89	0.50	9.39	-0.17
44	8.90	8.40	0.15	8.55	-0.35
45	9.07	8.41	0.15	8.56	-0.51
46	8.83	8.52	0.15	8.67	-0.16
47	8.94	8.65	0.15	8.80	-0.14
48	9.04	8.77	0.15	8.92	-0.12
49	9.14	8.86	0.15	9.01	-0.13
50	10.26	9.15	0.15	9.30	-0.96
51	10.26	9.96	0.15	10.11	-0.15
52	9.21	8.84	0.15	8.99	-0.22
53	9.07	8.76	0.15	8.91	-0.16
54	8.96	8.64	0.15	8.79	-0.17
55	10.15	9.55	0.15	9.70	-0.45
56	10.17	9.85	0.15	10.00	-0.17
57	10.08	9.78	0.15	9.93	-0.15
58	10.26	9.61	0.50	10.11	-0.15
59	10.07	9.50	0.50	10.00	-0.07
60	9.99	9.42	0.50	9.92	-0.07
61	9.90	9.30	0.50	9.80	-0.10
62	9.81	9.18	0.50	9.68	-0.13
63	9.48	8.90	0.50	9.40	-0.08
64	9.40	8.85	0.50	9.35	-0.05
65	9.31	8.71	0.50	9.21	-0.10
66	9.22	8.65	0.50	9.15	-0.07
67	9.14	8.54	0.50	9.04	-0.10
68	9.44	8.79	0.50	9.29	-0.15
69	9.29	8.66	0.50	9.16	-0.13
70	9.20	8.55	0.50	9.05	-0.15
71	9.10	8.48	0.50	8.98	-0.12
72	8.37	8.18	0.50	8.68	0.31
73	8.30	8.10	0.50	8.60	0.30
74	8.23	8.05	0.50	8.55	0.32
75	8.16	8.05	0.50	8.55	0.39
76	8.09	8.05	0.50	8.55	0.46
77	8.14	8.05	0.50	8.55	0.41
78	8.23	8.05	0.50	8.55	0.32
79	8.32	8.05	0.50	8.55	0.23
80	8.65	8.36	0.15	8.51	-0.14
81	8.73	8.42	0.15	8.57	-0.16
82	8.82	8.52	0.15	8.67	-0.15
83	9.14	8.78	0.15	8.93	-0.21
84	8.67	8.29	0.15	8.44	-0.23
85	8.83	8.45	0.15	8.60	-0.23
86	8.97	8.58	0.15	8.73	-0.24
87	9.18	8.60	0.50	9.10	-0.08
89	9.18	8.60	0.50	9.10	-0.08
90	9.11	8.60	0.50	9.10	-0.01

Stage 1

Lot	MFL (Consent Condition)	Final Flood Level	Freeboard Required	Final MFL (Minimum Floor Level)	Variation
91	9.22	8.60	0.50	9.10	-0.12
92	9.32	8.99	0.15	9.14	-0.18
93	9.32	9.07	0.15	9.22	-0.10
94	9.23	8.93	0.15	9.08	-0.15
95	9.32	9.04	0.15	9.19	-0.13
96	9.40	9.12	0.15	9.27	-0.13
97	9.49	9.21	0.15	9.36	-0.13
98	9.49	9.23	0.15	9.38	-0.11
99	9.47	9.18	0.15	9.33	-0.14
100	9.38	9.09	0.15	9.24	-0.14
101	9.29	9.01	0.15	9.16	-0.13
102	9.45	9.23	0.15	9.38	-0.07
103	9.45	9.15	0.15	9.30	-0.15
104	9.34	9.05	0.15	9.20	-0.14
105	9.23	8.93	0.15	9.08	-0.15
106	9.47	8.97	0.50	9.47	0.00
107	9.72	9.06	0.50	9.56	-0.16
108	9.72	9.06	0.50	9.56	-0.16
109	9.72	9.19	0.50	9.69	-0.03
110	9.91	9.20	0.50	9.70	-0.21
111	9.91	9.30	0.50	9.80	-0.11
112	9.91	9.35	0.50	9.85	-0.06
113	10.09	9.35	0.50	9.85	-0.24
114	10.09	9.45	0.50	9.95	-0.14
115	10.09	9.54	0.50	10.04	-0.05
116	9.74	9.39	0.15	9.54	-0.20
117	10.12	9.59	0.50	10.09	-0.03
229	9.82	9.46	0.15	9.61	-0.21

Stage 2

Lot	MFL (Consent Condition)	Final Flood Level	Freeboard Required	Final MFL	Variation
118	10.64	9.97	0.15	10.12	-0.52
119	10.14	9.85	0.15	10.00	-0.14
120	10.28	10.01	0.15	10.16	-0.12
121	10.36	10.16	0.15	10.31	-0.05
122	10.36	10.00	0.15	10.15	-0.21
123	11.04	10.78	0.15	10.93	-0.11
124	11.04	10.89	0.15	11.04	0.00
125	11.04	10.78	0.15	10.93	-0.11
126	10.94	10.66	0.15	10.81	-0.13
127	10.83	10.57	0.15	10.72	-0.11
128	10.95	10.45	0.15	10.60	-0.35
129	10.91	10.64	0.15	10.79	-0.12
130	11.04	10.74	0.15	10.89	-0.15
131	11.13	10.88	0.15	11.03	-0.10
132	11.13	10.82	0.15	10.97	-0.16
133	11.82	11.60	0.15	11.75	-0.07
134	12.01	11.72	0.15	11.87	-0.14
135	12.01	11.75	0.15	11.90	-0.11
136	11.88	11.55	0.15	11.70	-0.18
137	11.73	11.43	0.15	11.58	-0.15
138	11.69	11.39	0.15	11.54	-0.15
139	11.88	11.59	0.15	11.74	-0.14
140	12.01	11.75	0.15	11.90	-0.11
141	12.01	11.77	0.15	11.92	-0.09
142	11.84	11.64	0.15	11.79	-0.05
143	12.80	12.45	0.15	12.60	-0.20
144	12.91	12.59	0.15	12.74	-0.17
145	12.91	12.58	0.15	12.73	-0.18
146	12.73	12.37	0.15	12.52	-0.21
147	12.51	12.16	0.15	12.31	-0.20
148	12.29	11.92	0.15	12.07	-0.22
149	12.30	12.03	0.15	12.18	-0.12
150	12.46	12.11	0.15	12.26	-0.20
151	12.69	12.35	0.15	12.50	-0.19
152	12.90	12.58	0.15	12.73	-0.17
153	12.90	12.65	0.15	12.80	-0.10
154	12.82	12.49	0.15	12.64	-0.18
155	13.34	12.98	0.15	13.13	-0.21
156	13.46	13.09	0.15	13.24	-0.22
157	13.46	13.10	0.15	13.25	-0.21
158	13.29	12.89	0.15	13.04	-0.25
159	13.06	12.64	0.15	12.79	-0.27
160	12.79	12.39	0.15	12.54	-0.25
212	12.42	12.14	0.15	12.29	-0.13
213	12.33	12.05	0.15	12.20	-0.13
214	12.23	11.96	0.15	12.11	-0.12
215	12.14	11.83	0.15	11.98	-0.16
216	12.02	11.65	0.15	11.80	-0.22
217	11.85	11.54	0.15	11.69	-0.16
218	11.70	11.41	0.15	11.56	-0.14
219	11.55	11.25	0.15	11.40	-0.15
220	11.40	11.11	0.15	11.26	-0.14
221	11.25	10.99	0.15	11.14	-0.11
222	11.09	10.83	0.15	10.98	-0.11
223	10.94	10.69	0.15	10.84	-0.10
224	10.99	10.53	0.15	10.68	-0.31
225	10.99	10.38	0.15	10.53	-0.46
226	10.83	10.18	0.15	10.33	-0.50
227	10.68	10.04	0.15	10.19	-0.49
228	10.53	9.92	0.15	10.07	-0.46
1001	10.85	10.49	0.15	10.64	-0.21
1002	11.63	11.44	0.15	11.59	-0.04
1003	12.67	12.33	0.15	12.48	-0.19
1004	13.22	12.83	0.15	12.98	-0.24
5000 / 1007	11.69	11.28	0.15	11.43	-0.26

Stage 3

Lot	MFL (Consent Condition)	Final Flood Level	Freeboard Required	Final MFL (Minimum Floor Level)	Variation
161	12.74	12.43	0.15	12.58	-0.16
162	12.96	12.63	0.15	12.78	-0.18
163	13.19	12.82	0.15	12.97	-0.22
164	13.41	13.07	0.15	13.22	-0.19
165	13.41	13.15	0.15	13.30	-0.11
166	13.37	13.06	0.15	13.21	-0.16
167	12.94	12.70	0.15	12.85	-0.09
168	12.84	12.60	0.15	12.75	-0.09
169	12.73	12.48	0.15	12.63	-0.10
170	12.59	12.35	0.15	12.50	-0.09
171	12.48	12.25	0.15	12.40	-0.08
172	12.60	12.15	0.15	12.30	-0.30
173	13.98	13.63	0.15	13.78	-0.20
174	14.16	13.93	0.15	14.08	-0.08
175	14.16	13.81	0.15	13.96	-0.20
176	13.91	13.58	0.15	13.73	-0.18
177	13.67	13.35	0.15	13.50	-0.17
178	13.78	13.47	0.15	13.62	-0.16
179	13.85	13.28	0.15	13.43	-0.42
180	13.03	12.56	0.15	12.71	-0.32
181	12.57	12.20	0.15	12.35	-0.22
182	12.19	11.23	0.50	11.73	-0.46
183	13.27	13.00	0.15	13.15	-0.12
184	13.38	13.10	0.15	13.25	-0.13
185	13.49	13.21	0.15	13.36	-0.13
186	13.60	13.32	0.15	13.47	-0.13
187	13.72	13.43	0.15	13.58	-0.14
188	13.83	13.54	0.15	13.69	-0.14
189	13.98	13.68	0.15	13.83	-0.15
190	14.08	13.80	0.15	13.95	-0.13
191	14.19	13.91	0.15	14.06	-0.13
192	14.19	13.97	0.15	14.12	-0.07
193	14.13	13.84	0.15	13.99	-0.14
194	13.97	13.71	0.15	13.86	-0.11
195	12.97	12.70	0.15	12.85	-0.12
196	12.82	12.57	0.15	12.72	-0.10
197	12.70	12.46	0.15	12.61	-0.09
198	12.57	12.35	0.15	12.50	-0.07
199	12.45	12.23	0.15	12.38	-0.07
200	12.32	12.11	0.15	12.26	-0.06
201	12.44	11.94	0.50	12.44	0.00
202	12.44	11.83	0.50	12.33	-0.11
203	12.32	11.88	0.50	12.38	0.06
204	12.46	11.76	0.15	11.91	-0.55
205	12.46	11.90	0.15	12.05	-0.41
206	12.82	12.52	0.15	12.67	-0.15
207	12.44	11.99	0.15	12.14	-0.30
208	12.44	11.75	0.50	12.25	-0.19
209	12.36	11.79	0.50	12.29	-0.07
210	12.57	11.94	0.50	12.44	-0.13
211	12.60	12.44	0.15	12.59	-0.01
1005	13.36	13.08	0.15	13.23	-0.13
1006	13.84	13.55	0.15	13.70	-0.14

ASBUILT

DATE: 3/9/25

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.

Rev	Description	By	Date
F	LOT FGL UPDATE	ML	03/2025
E	LOT 87 - 91 MFL UPDATE	ML	02/2025
D	FLOOD EXTENT UPDATE	ML	01/2025
C	CROSS-SECTION UPDATE	ML	01/2025

	By	Date
Survey	-	-
Design	ML	11/2024
Drawn	ML	11/2024
Checked	JD	11/2024

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

Project

62, 78 & 80 PAPAKURA - 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-BUILT.DWG
Drawing no.	C480 Rev F

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

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

$= 0.14 \quad 0.6 \quad 0.34 \quad 1.11 \quad 1.67 =$ 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation EX Catchment A	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.0124	km2(100ha =1km2)
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.84		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.563**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	255.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	3165.21	(m3)	

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

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation EX Catchment B	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.014	km2(100ha =1km2)
Runoff curve number	CN=	90.8	(from worksheet 1)
Initial abstraction	Ia=	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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.84		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.636**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	255.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) 10000m2=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) = $\frac{\text{total product}}{\text{total area}} = \frac{228.79}{2.581} =$ 88.6

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.0060}{2.581}$ 1.9 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, $\frac{CN}{200 - CN} = \frac{88.6}{200 - 88.6} =$ 0.80

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation EX Catchment C	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.02581	km2(100ha =1km2)
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.81		
6. Specific peak flow rate q*	0.160		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.158**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	249.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	6432.91	(m3)	

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) 10000m2=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 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, $\frac{CN}{200 - CN} = \frac{75.0}{200 - 75.0} =$ 0.60

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation EX Catchment D	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.02693	km2(100ha =1km2)
Runoff curve number	CN=	75.0	(from worksheet 1)
Initial abstraction	Ia=	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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.61		
6. Specific peak flow rate q*	0.141		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.067**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	210.7		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{74.0}{200 - 74.0} =$ 0.59

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

= 0.14 0.6 0.37 1.34 2.01 = 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 10	Rev A
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation EX Catchment E	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.01777	km2(100ha =1km2)
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	100	(yr)	
4. 24 hour rainfall depth, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.61		
6. Specific peak flow rate q*	0.141		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.701**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	212.6		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	3778.39	(m3)	

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

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

$= 0.14 \quad 0.6 \quad 0.39 \quad 1.11 \quad 1.15 =$ 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	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.84		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.489**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	255.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2747.10	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 1	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 1	ML	15/11/2024	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 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, $\frac{CN}{200 - CN} = \frac{90.8}{200 - 90.8} =$ 0.83

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

$= 0.14 \quad 0.6 \quad 0.22 \quad 1.11 \quad 1.60 =$ 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	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.84		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.101**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	257.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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	Exisiting Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	6.667	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 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, $\frac{CN}{200 - CN} = \frac{87.4}{200 - 87.4} =$ 0.78

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

= 0.14 0.6 0.80 1.15 2.17 = 0.17 hrs

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	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.79		
6. Specific peak flow rate q*	0.159		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.968**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	245.9		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	16393.44	(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 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) 10000m2=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	Exisiting 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) = total product / total area = 355.84 / 4.400 = 80.9

Ia (average) = 5 x pervious area / total area = 5 x 3.1400 / 4.400 = 3.6 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, CN / (200 - CN) = 80.9 / (200- 80.9) = 0.68

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 3	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.044	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.69		
6. Specific peak flow rate q*	0.150		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.856**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	227.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	10005.27	(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 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	Exisiting 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) = total product / total area = 199.06 / 2.690 = 74.0

Ia (average) = 5 x pervious area / total area = 5 x 2.6900 / 2.690 = 5.0 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, CN / (200 - CN) = 74.0 / (200- 74.0) = 0.59

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 3A	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.0269	km2(100ha =1km2)	
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	100	(yr)	
4. 24 hour rainfall depth, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.60		
6. Specific peak flow rate q*	0.140		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.053**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	207.9		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	5593.13	(m3)	

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) 10000m2=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	Exisiting 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) = total product / total area = 252.63 / 3.280 = 77.0

Ia (average) = 5 x pervious area / total area = 5 x 2.8670 / 3.280 = 4.4 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, CN / (200 - CN) = 77.0 / (200- 77.0) = 0.63

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment S3B	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.0328	km2(100ha =1km2)	
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	100	(yr)	
4. 24 hour rainfall depth, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.64		
6. Specific peak flow rate q*	0.145		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.330**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	216.5		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	7101.16	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 11	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 4	ML	15/11/2024	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	Eisiting Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	5.870	508.97

CN (weighted) = total product / total area = 508.97 / 5.870 = 86.7

Ia (average) = 5 x pervious area / total area = 5 x 2.7616 / 5.870 = 2.4 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, CN / (200 - CN) = 86.7 / (200- 86.7) = 0.77

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

= 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	Ia=	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* = P24 - 2Ia/P24 - 2Ia+2S	0.78		
6. Specific peak flow rate q*	0.158		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.600**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	243.8		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	14311.80	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 13	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 5	ML	15/11/2024	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	Exisiting Lots	74	1.78	131.50
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	5.680	491.27

CN (weighted) = total product / total area = 491.27 / 5.680 = 86.5

Ia (average) = 5 x pervious area / total area = 5 x 2.7220 / 5.680 = 2.4 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, CN / (200 - CN) = 86.5 / (200- 86.5) = 0.76

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 5	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.056796	km2(100ha =1km2)	
Runoff curve number	CN=	86.5	(from worksheet 1)	
Initial abstraction	Ia=	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* = P24 - 2Ia/P24 - 2Ia+2S	0.78		
6. Specific peak flow rate q*	0.158		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.512**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	243.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	13814.17	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 194006	Sheet 15	Rev 1
Job Title: Clevedon Meadows Calc Title: 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	Exisiting Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	0.571	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 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, $\frac{CN}{200 - CN} = \frac{91.4}{200 - 91.4} =$ 0.84

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

$= 0.14 \quad 0.6 \quad 0.15 \quad 1.10 \quad 3.98 =$ 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 6	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.005707	km2(100ha =1km2)	
Runoff curve number	CN=	91.4	(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 = 23.8 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.260**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	257.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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	Exisiting 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 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, $\frac{CN}{200 - CN} = \frac{85.8}{200- 85.8} =$ 0.75

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

$= 0.14 \quad 0.6 \quad 0.54 \quad 1.17 \quad 2.00 =$ 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	Ia=	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* = P24 - 2Ia/P24 - 2Ia+2S	0.77		
6. Specific peak flow rate q*	0.157		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.196**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	241.1		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) 10000m2=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	Exisiting Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	0.755	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 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, $\frac{CN}{200 - CN} = \frac{91.3}{200- 91.3} =$ 0.84

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

= 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	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.344**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	256.7		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1936.60	(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 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) 10000m2=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	Exisiting Lots	74	1.17	86.58
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	3.737	324.34

CN (weighted) = total product / total area = 324.34 / 3.737 = 86.8

Ia (average) = 5 x pervious area / total area = 5 x 1.7463 / 3.737 = 2.3 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, CN / (200 - CN) = 86.8 / (200- 86.8) = 0.77

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 9	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.037373	km2(100ha =1km2)	
Runoff curve number	CN=	86.8	(from worksheet 1)	
Initial abstraction	Ia=	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* = P24 - 2Ia/P24 - 2Ia+2S	0.78		
6. Specific peak flow rate q*	0.158		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.656**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	244.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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	Exisiting Lots	74	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	0.756	69.02

CN (weighted) = total product / total area = 69.02 / 0.756 = 91.3

Ia (average) = 5 x pervious area / total area = 5 x 0.2094 / 0.756 = 1.4 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, CN / (200 - CN) = 91.3 / (200- 91.3) = 0.84

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 10	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.007556	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.344**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	256.8		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1940.32	(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 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) 10000m2=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	Exisiting 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) = total product / total area = 125.62 / 1.355 = 92.7

Ia (average) = 5 x pervious area / total area = 5 x 0.2984 / 1.355 = 1.1 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, CN / (200 - CN) = 92.7 / (200- 92.7) = 0.86

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 11	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.013549	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.164		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.621**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.6		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	3530.72	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 27	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 12	ML	15/11/2024	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	Exisiting 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 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, $\frac{CN}{200 - CN} = \frac{91.1}{200 - 91.1} =$ 0.84

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 12	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.006873	km2(100ha =1km2)	
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	100	(yr)	
4. 24 hour rainfall depth, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.313**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	256.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1759.69	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 29	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 13	ML	15/11/2024	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	Exisiting 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) = $\frac{\text{total product}}{\text{total area}} = \frac{39.24}{0.416} =$ 94.4

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0624}{0.416}$ 0.8 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, $\frac{CN}{200 - CN} = \frac{94.4}{200- 94.4} =$ 0.89

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

= 0.14 0.6 0.27 1.06 2.46 = 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 30	Rev 1
Job Title: Clevedon Meadows Calc Title: TP108 Calculation PR Catchment 13	Author: ML	Date: 15/11/2024	Checked: JD

1. Data

Catchment Area	A=	0.004157	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.90		
6. Specific peak flow rate q*	0.165		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.192**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	265.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1102.74	(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 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	Exisiting 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 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, $\frac{CN}{200 - CN} = \frac{94.4}{200- 94.4} =$ 0.89

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

= 0.14 0.6 0.20 1.06 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 32	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 13A	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.001581	km2(100ha =1km2)	
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, P24	280.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.90		
6. Specific peak flow rate q*	0.165		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.073**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	265.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	419.40	(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 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) = $\frac{\text{total product}}{\text{total area}} = \frac{884.35}{9.621} =$ 91.9

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.4360}{9.621}$ 1.3 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, $\frac{CN}{200 - CN} = \frac{91.9}{200-91.9} =$ 0.85

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

= 0.14 0.6 0.87 1.09 4.43 = 0.36 hrs

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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 14	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.096206	km2(100ha =1km2)	
Runoff curve number	CN=	91.9	(from worksheet 1)	
Initial abstraction	Ia=	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* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.131		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**3.558**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) 10000m2=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 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, $\frac{CN}{200 - CN} = \frac{92.2}{200 - 92.2} =$ 0.86

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

= 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: Clevedon Meadows Calc Title: 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	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 = 21.4 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.510**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	261.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2892.59	(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) = total product / total area = 782.18 / 8.513 = 91.9

Ia (average) = 5 x pervious area / total area = 5 x 2.1718 / 8.513 = 1.3 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, CN / (200 - CN) = 91.9 / (200- 91.9) = 0.85

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

= 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: Clevedon Meadows Calc Title: 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	Ia=	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	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.131		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**3.149**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{91.9}{200- 91.9} =$ 0.85

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

= 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 8	Rev 1
Job Title: Clevedon Meadows Calc Title: TP108 Calculation PR Catchment 16A	Author: ML	Date: 1/11/2024	Checked: JD

1. Data

Catchment Area	A=	0.076932	km2(100ha =1km2)	
Runoff curve number	CN=	91.9	(from worksheet 1)	
Initial abstraction	Ia=	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* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.131		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.845**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	20034.26	(m3)	

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 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 =	0.901	84.39

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

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.1625}{0.901}$ 0.9 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, $\frac{CN}{200 - CN} = \frac{93.7}{200-93.7} =$ 0.88

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 17	ML	1/11/2024	JD

1. Data

Catchment Area	A=	0.009009	km2(100ha =1km2)	
Runoff curve number	CN=	93.7	(from worksheet 1)	
Initial abstraction	Ia=	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* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	265.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) = $\frac{\text{total product}}{\text{total area}} = \frac{32.44}{0.347} =$ 93.4

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.0669}{0.347}$ 1.0 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, $\frac{CN}{200 - CN} = \frac{93.4}{200- 93.4} =$ 0.88

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

= 0.14 0.6 0.16 1.08 2.46 = 0.04 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 12	Rev 1
Job Title: Clevedon Meadows Calc Title: 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	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 = 18.0 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	264.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 =	6.282	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 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, $\frac{CN}{200 - CN} = \frac{92.0}{200 - 92.0} =$ 0.85

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

= 0.14 0.6 0.78 1.09 2.24 = 0.16 hrs

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: Clevedon Meadows Calc Title: TP108 Calculation PR Catchment 19	Author: ML	Date: 1/11/2024	Checked: JD

1. Data

Catchment Area	A=	0.062824	km2(100ha =1km2)	
Runoff curve number	CN=	92.0	(from worksheet 1)	
Initial abstraction	Ia=	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.892**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.5		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	16365.36	(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 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 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, $\frac{CN}{200 - CN} = \frac{92.4}{200-92.4} =$ 0.86

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

= 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

MAVEN ASSOCIATES	Job Number 194006	Sheet 16	Rev 1
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	km2(100ha =1km2)	
Runoff curve number	CN=	92.4	(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 = 20.9 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.174**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	261.7		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	986.30	(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 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) 10000m2=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 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, $\frac{CN}{200 - CN} = \frac{92.0}{200-92.0} =$ 0.85

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

= 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: Clevedon Meadows Calc Title: 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	Ia=	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.511**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.5		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	14209.27	(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 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, $\frac{CN}{200 - CN} = \frac{94.4}{200- 94.4} =$ 0.89

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 22	ML	1/11/2024	JD

1. Data

Catchment Area	A=	0.000654	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	267.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{92.1}{200-92.1} =$ 0.85

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

= 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

MAVEN ASSOCIATES	Job Number 194006	Sheet 22	Rev 1
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	km2(100ha =1km2)	
Runoff curve number	CN=	92.1	(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 = 21.9 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.966**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.8		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	11132.13	(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 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 =	0.929	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 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, $\frac{CN}{200 - CN} = \frac{91.4}{200-91.4} =$ 0.84

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

= 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: Clevedon Meadows Calc Title: 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	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.427**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.1		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) = total product / total area = 300.62 / 3.261 = 92.2

Ia (average) = 5 x pervious area / total area = 5 x 0.7879 / 3.261 = 1.2 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, CN / (200 - CN) = 92.2 / (200- 92.2) = 0.86

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 25	ML	1/11/2024	JD

1. Data

Catchment Area	A=	0.032605	km2(100ha =1km2)	
Runoff curve number	CN=	92.2	(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 = 21.5 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.503**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	261.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	8514.81	(m3)	

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

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

= 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: Clevedon Meadows Calc Title: 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	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	267.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{92.1}{200-92.1} =$ 0.85

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

= 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: Clevedon Meadows Calc Title: 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	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 = 21.7 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.459**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	261.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{93.7}{200-93.7} =$ 0.88

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

= 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: Clevedon Meadows Calc Title: 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	Ia=	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* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	265.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{92.2}{200-92.2} =$ 0.86

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

= 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: Clevedon Meadows Calc Title: 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	Ia=	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* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	261.1		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) = $\frac{\text{total product}}{\text{total area}} = \frac{74.07}{0.810} =$ 91.4

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2218}{0.810}$ 1.4 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, $\frac{CN}{200 - CN} = \frac{91.4}{200-91.4} =$ 0.84

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

= 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: Clevedon Meadows Calc Title: 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	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 = 23.8 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.372**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2098.15	(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 =	0.810	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 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, $\frac{CN}{200 - CN} = \frac{91.4}{200-91.4} =$ 0.84

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

= 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: Clevedon Meadows Calc Title: 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	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 = 23.8 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.372**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2098.15	(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) = $\frac{\text{total product}}{\text{total area}} = \frac{74.07}{0.810} =$ 91.4

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2218}{0.810}$ 1.4 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, $\frac{CN}{200 - CN} = \frac{91.4}{200-91.4} =$ 0.84

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 32	ML	1/11/2024	JD

1. Data

Catchment Area	A=	0.008101	km2(100ha =1km2)	
Runoff curve number	CN=	91.4	(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 = 23.8 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.85		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.372**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2098.15	(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 =	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 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, $\frac{CN}{200 - CN} = \frac{94.4}{200- 94.4} =$ 0.89

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

= 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: Clevedon Meadows Calc Title: 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	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.90		
6. Specific peak flow rate q*	0.165		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.119**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	267.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	685.54	(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 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, $\frac{CN}{200 - CN} = \frac{94.4}{200-94.4} =$ 0.89

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

= 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: Clevedon Meadows Calc Title: 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	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.90		
6. Specific peak flow rate q*	0.165		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.119**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	267.3		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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) = $\frac{\text{total product}}{\text{total area}} = \frac{422.91}{4.617} =$ 91.6

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.0743}{4.617}$ 1.2 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, $\frac{CN}{200 - CN} = \frac{91.6}{200-91.6} =$ 0.85

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 35	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.046165	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.122**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.7		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	11987.45	(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 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) = total product / total area = 481.72 / 5.260 = 91.6

Ia (average) = 5 x pervious area / total area = 5 x 1.4049 / 5.260 = 1.3 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, CN / (200 - CN) = 91.6 / (200- 91.6) = 0.84

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 36	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.052596	km2(100ha =1km2)	
Runoff curve number	CN=	91.6	(from worksheet 1)	
Initial abstraction	Ia=	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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.417**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	13645.92	(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 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 =	0.646	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 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, $\frac{CN}{200 - CN} = \frac{91.5}{200- 91.5} =$ 0.84

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

= 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	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.297**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.1		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1674.78	(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 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) = $\frac{\text{total product}}{\text{total area}} = \frac{364.46}{3.978} =$ 91.6

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.9178}{3.978}$ 1.2 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, $\frac{CN}{200 - CN} = \frac{91.6}{200-91.6} =$ 0.85

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

$= 0.14 \quad 0.6 \quad 0.56 \quad 1.10 \quad 2.46 =$ 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 37	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.039775	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.828**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.7		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	10330.99	(m3)	

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

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.9169}{3.800}$ 1.2 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, $\frac{CN}{200 - CN} = \frac{91.5}{200 - 91.5} =$ 0.84

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 38	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.038004	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.746**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	259.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	9856.62	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 11	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 39	ML	15/11/2024	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 =	0.740	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 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, $\frac{CN}{200 - CN} = \frac{92.5}{200 - 92.5} =$ 0.86

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

$= 0.14 \quad 0.6 \quad 0.33 \quad 1.09 \quad 2.46 =$ 0.07 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 12	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 39	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.007397	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+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, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	262.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1941.22	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 13	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 40	ML	15/11/2024	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	0.28	26.44
C	Existing Lots	90.8	0.00	0.00
C	Existing Roads	94.4	0.00	0.00
* from Appendix B		Totals =	0.636	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 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, $\frac{CN}{200 - CN} = \frac{92.4}{200-92.4} =$ 0.86

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

= 0.14 0.6 0.26 1.09 2.46 = 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 14	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 40	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.00636	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.293**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	262.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1666.29	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 15	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 41	ML	15/11/2024	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	46.97

CN (weighted) = total product / total area = 46.97 / 0.511 = 91.9

Ia (average) = 5 x pervious area / total area = 5 x 0.1068 / 0.511 = 1.0 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, CN / (200 - CN) = 91.9 / (200- 91.9) = 0.85

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 41	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.005111	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.235**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.5		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1331.52	(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 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 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, $\frac{CN}{200 - CN} = \frac{91.9}{200- 91.9} =$ 0.85

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 42	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.011906	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.86		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.548**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	260.5		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	3101.16	(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 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) = $\frac{\text{total product}}{\text{total area}} = \frac{121.02}{1.314} =$ 92.1

Ia (average) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.2504}{1.314}$ 1.0 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, $\frac{CN}{200 - CN} = \frac{92.1}{200 - 92.1} =$ 0.85

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 43	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.013138	km2(100ha =1km2)	
Runoff curve number	CN=	92.1	(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 = 21.7 mm

3. Average recurrence interval, ARI	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.605**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	261.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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 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, $\frac{CN}{200 - CN} = \frac{92.5}{200 - 92.5} =$ 0.86

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

= 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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 44	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.016096	km2(100ha =1km2)	
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, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.87		
6. Specific peak flow rate q*	0.163		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.743**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	262.4		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	4224.26	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 194006	Sheet 23	Rev 1
Job Title	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 45	ML	15/11/2024	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) = total product / total area = 610.48 / 7.000 = 87.2

Ia (average) = 5 x pervious area / total area = 5 x 3.1448 / 7.000 = 2.2 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, CN / (200 - CN) = 87.2 / (200- 87.2) = 0.77

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

= 0.14 0.6 0.77 1.15 2.50 = 0.19 hrs

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	Clevedon Meadows	Author	Date	Checked
Calc Title	TP108 Calculation PR Catchment 45	ML	15/11/2024	JD

1. Data

Catchment Area	A=	0.069995	km2(100ha =1km2)	
Runoff curve number	CN=	87.2	(from worksheet 1)	
Initial abstraction	Ia=	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	100	(yr)	
4. 24 hour rainfall depth, P24	282.32	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.79		
6. Specific peak flow rate q*	0.162		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**3.201**	m3/s	0.268 (GIS)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	247.2		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	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

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

Where	Q=	Channel Flow	122	l/s
	S =	Longitudinal Slope	0.008	m/m
	A =	Cross sectional area	0.254	m2
	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) R(2/3) S(1/2)/ n	0.482	m/sec
Depth x Velocity (D.V)	0.04	
Channel Flow (Q) VxA	**122**	l/sec
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 Calc Title: Proposed Overland Flowpath - Section 2	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

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	m^2
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 Calc Title: Proposed Overland Flowpath - Section 3	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	1871	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	2.086	m2
	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) R(2/3) S(1/2)/ n	0.897	m/sec
Depth x Velocity (D.V)	0.24	
Channel Flow (Q) VxA	**1871**	l/sec
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 Calc Title: Proposed Overland Flowpath - Section 3A	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	1092	l/s
	S =	Longitudinal Slope	0.003	m/m
	A =	Cross sectional area	0.988	m2
	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 Calc Title: Proposed Overland Flowpath - Section 3B	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	1339	l/s
	S =	Longitudinal Slope	0.003	m/m
	A =	Cross sectional area	1.145	m2
	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= $(AR^{2/3}S^{1/2})/n$ R=A/P

Where	Q=	Channel Flow	2698	l/s
	S =	Longitudinal Slope	0.007	m/m
	A =	Cross sectional area	2.448	m2
	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 Calc Title: Proposed Overland Flowpath - Section 5	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	2546	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	2.627	m2
	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) R(2/3) S(1/2)/ n	0.969	m/sec
Depth x Velocity (D.V)	0.28	
Channel Flow (Q) VxA	**2546**	l/sec
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

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

Where	Q=	Channel Flow	279	l/s
	S =	Longitudinal Slope	0.009	m/m
	A =	Cross sectional area	0.403	m2
	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) R(2/3) S(1/2)/ n	0.692	m/sec
Depth x Velocity (D.V)	0.08	
Channel Flow (Q) VxA	**279**	l/sec
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

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

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	m^2
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 Calc Title: Proposed Overland Flowpath - Section 8	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	365	l/s
	S =	Longitudinal Slope	0.006	m/m
	A =	Cross sectional area	0.524	m2
	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) R(2/3) S(1/2)/ n	0.696	m/sec
Depth x Velocity (D.V)	0.09	
Channel Flow (Q) VxA	**365**	l/sec
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

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

Where	Q=	Channel Flow	1677	l/s
	S =	Longitudinal Slope	0.013	m/m
	A =	Cross sectional area	1.353	m2
	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	Date	Checked
Calc Title: Proposed Overland Flowpath - Section 10	ML	15/11/2024	JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	350	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.56	m2
	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) R(2/3) S(1/2)/ n	0.625	m/sec
Depth x Velocity (D.V)	0.08	
Channel Flow (Q) VxA	**350**	l/sec
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 Calc Title: Proposed Overland Flowpath - Section 11	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	666	l/s
	S =	Longitudinal Slope	0.013	m/m
	A =	Cross sectional area	0.654	m2
	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 Calc Title: Proposed Overland Flowpath - Section 12	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	335	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.526	m2
	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 Calc Title: Proposed Overland Flowpath - Section 13	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	213	l/s
	S =	Longitudinal Slope	0.004	m/m
	A =	Cross sectional area	0.438	m2
	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 Calc Title: Proposed Overland Flowpath - Section 13A	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	80	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.208	m2
	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) R(2/3) S(1/2)/ n	0.387	m/sec
Depth x Velocity (D.V)	0.03	
Channel Flow (Q) VxA	**80**	l/sec
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

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

Where	Q=	Channel Flow	2902	l/s
	S =	Longitudinal Slope	0.007	m/m
	A =	Cross sectional area	2.597	m2
	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) R(2/3) S(1/2)/ n	1.117	m/sec
Depth x Velocity (D.V)	0.32	
Channel Flow (Q) VxA	**2902**	l/sec
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= $(AR^{2/3}S^{1/2})/n$ 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	m^2
P=	18.79	m
R=	0.043	
n=	0.020	
Velocity (V) R(2/3) S(1/2)/ n	0.550	m/sec
Depth x Velocity (D.V)	0.09	
Channel Flow (Q) VxA	**447**	l/sec
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 Calc Title: Mannings Calculations - Section 18	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	166	l/s
	S =	Longitudinal Slope	0.002	m/m
	A =	Cross sectional area	0.628	m2
	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 Calc Title: Mannings Calculations - Section 19	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	2956	l/s
	S =	Longitudinal Slope	0.008	m/m
	A =	Cross sectional area	3.137	m2
	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 Calc Title: Mannings Calculations - Section 20	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	195	l/s
	S =	Longitudinal Slope	0.006	m/m
	A =	Cross sectional area	0.471	m2
	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 Calc Title: Mannings Calculations - Section 21	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	2543	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	3.301	m2
	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) R(2/3) S(1/2)/ n	0.770	m/sec
Depth x Velocity (D.V)	0.26	
Channel Flow (Q) VxA	**2543**	l/sec
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 Calc Title: Mannings Calculations - Section 22	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	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	m^2
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 Calc Title: Mannings Calculations - Section 23	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	2075	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	2.92	m2
	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 Calc Title: Proposed Overland Flowpath - Section 24	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	449	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.696	m2
	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 Calc Title: Proposed Overland Flowpath - Section 25	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	1521	l/s
	S =	Longitudinal Slope	0.008	m/m
	A =	Cross sectional area	1.485	m2
	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 Calc Title: Proposed Overland Flowpath - Section 26	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	67	l/s
	S =	Longitudinal Slope	0.014	m/m
	A =	Cross sectional area	0.12	m2
	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) R(2/3) S(1/2)/ n	0.559	m/sec
Depth x Velocity (D.V)	0.03	
Channel Flow (Q) VxA	**67**	l/sec
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 Calc Title: Proposed Overland Flowpath - Section 27	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

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	m^2
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 Calc Title: Proposed Overland Flowpath - Section 28	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	391	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.613	m2
	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 Calc Title: Proposed Overland Flowpath - Section 29	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

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	m^2
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 Calc Title: Proposed Overland Flowpath - Section 30	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	423	l/s
	S =	Longitudinal Slope	0.008	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= **0.008** 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 Calc Title: Proposed Overland Flowpath - Section 31	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

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	m^2
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 Calc Title: Proposed Overland Flowpath - Section 32	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	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	m^2
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 Calc Title: Proposed Overland Flowpath - Section 33	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	140	l/s
	S =	Longitudinal Slope	0.009	m/m
	A =	Cross sectional area	0.246	m2
	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	Date	Checked
Calc Title: Proposed Overland Flowpath - Section 34	ML	15/11/2024	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	155	l/s
	S =	Longitudinal Slope	0.011	m/m
	A =	Cross sectional area	0.246	m2
	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 Calc Title: Mannings Calculations - Section 35	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	2148	l/s
	S =	Longitudinal Slope	0.003	m/m
	A =	Cross sectional area	3.478	m2
	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

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

Where	Q=	Channel Flow	2476	l/s
	S =	Longitudinal Slope	0.009	m/m
	A =	Cross sectional area	1.381	m2
	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

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

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	m^2
P=	6.86	m
R=	0.076	
n=	0.020	
Velocity (V) R(2/3) S(1/2)/ n	0.637	m/sec
Depth x Velocity (D.V)	0.19	
Channel Flow (Q) VxA	**334**	l/sec
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 Calc Title: Mannings Calculations - Section 37	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

Where	Q=	Channel Flow	1841	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	2.717	m2
	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) R(2/3) S(1/2)/ n	0.678	m/sec
Depth x Velocity (D.V)	0.20	
Channel Flow (Q) VxA	**1841**	l/sec
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 Calc Title: Mannings Calculations - Section 38	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	1790	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	2.66	m2
	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) R(2/3) S(1/2)/ n	0.673	m/sec
Depth x Velocity (D.V)	0.17	
Channel Flow (Q) VxA	**1790**	l/sec
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= $(AR^{2/3}S^{1/2})/n$ 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	m^2
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 Calc Title: Mannings Calculations - Section 40	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	305	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.728	m2
	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= $(AR^{2/3}S^{1/2})/n$ R=A/P

Where	Q=	Channel Flow	242	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	0.567	m2
	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 Calc Title: Mannings Calculations - Section 42	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	574	l/s
	S =	Longitudinal Slope	0.005	m/m
	A =	Cross sectional area	1.114	m2
	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

$Q = (AR^{2/3}S^{1/2})/n$ 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	m^2
P=	22.06	m
R=	0.045	
n=	0.020	
Velocity (V) R(2/3) S(1/2)/ n	0.635	m/sec
Depth x Velocity (D.V)	0.11	
Channel Flow (Q) VxA	**635**	l/sec
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 Calc Title: Mannings Calculations - Section 44	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	753	l/s
	S =	Longitudinal Slope	0.017	m/m
	A =	Cross sectional area	0.929	m2
	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
Job Title: Clevedon Meadows Calc Title: Mannings Calculations - Section 45	Author: ML	Date: 15/11/2024	Checked: JD

Design Spreadsheet for Mannings Formula

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

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

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	m^2
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

APPENDIX D – WEIR CALCULATIONS

MAVEN ASSOCIATES		Job Number 194006	Sheet 1	Rev A
Job Title	62, 78 & 80 Papakura-Clevedon Road, Clevedon	Author	Date	Checked
Calc Title	Flood Assessment Weir Calculations	ML	7/02/2025	JD

Section 14

Discharge over broad crested weir

$Q = 1.7 \times L \times H^{3/2}$

Trying

L =	21.893	m
H =	0.209	m
Q =	3.558	m^3/s

Q(TP108) = 3.558 m^3/s

Velocity 0.833 m/s

DEPTH X VELOCITY 0.25 (worst case)

Energy Grade Line **0.244 m**