MAVEN ASSOCIATES	Job Number 117019	Sheet 1	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title SW QUALITY CALS CATCHMENT B	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98		0.00
C	Grass (landscape and gardens)	74	0.2014	14.90
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.2014	14.90

WQV

CN (weighted) = total product / total area = 14.90 / 0.201 = 74.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.2 / 0.201 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2)

Catchment length L = 0.3 km (along drainage path)

Catchment Slope Sc= 0.005 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 1 0.45 1.34 4.90 = 0.415 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.278 hrs

OK
use
0.4153971 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 2	Rev A
Job 2581 SH1 RUAKAKA Calc SW QUALITY CALS CATCHMENT B	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.002014	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=	0.4153971	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 89 mm

3. Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4. 24 hour rainfall depth, P24		32.9	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.114	
6. Specific peak flow rate q*		0.036	
7. Peak flow rate, $q_p=q^*A^*P_{24}$		**0.002**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		6.6	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$		13.38	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 3	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98	0.2014	19.74
C	Grass (landscape and gardens)	74	0	0.00
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.2014	19.74

WQV

CN (weighted) = total product / total area = 19.74 / 0.201 = 98.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.0 / 0.201 = 0.0 mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.3 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 98.0 / (200- 98.0) = 0.96

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

= 0.1 0.6 0.45 1.02 4.90 = 0.190 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.127 hrs

OK
use
0.1901271 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES		Job Number 117019	Sheet 4	Rev A
Job Title Calc Title	2581 SH1 RUAKAKA Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.002014	km2(100ha =1km2)
Runoff curve number	CN=	98.0	(from worksheet 1)
Initial abstraction	Ia=	0.0	mm (from worksheet 1)
Time of concentration	tc=	0.190127118	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 5 mm

3.	Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4.	24 hour rainfall depth, P24		36.7	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.780	
6.	Specific peak flow rate q*		0.158	
7.	Peak flow rate, q_p=q*A*P_{24}		**0.012**	
8.	Runoff depth, Q_{24} = $(P_{24}$-Ia$)^2/(P_{24}$-Ia)+S		32.1	
9.	Runoff volume, V_{24} = 1000xQ_{24}A		64.70	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**13.38**	(m3)
Post development run off volume	**64.70**	(m3)
Pre development flow rate	**0.00**	(m3/s)
Post development flow rate	**0.01**	(m3/s)
Detention Volume Required	**51.32**	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 117019	Sheet 5	Rev A
Job Title	2581 SH1 RUAKAKA	Author	Date	Checked
Calc Title	Post-development SW Demand	KH	22/09/2020	LC

SWALE DESIGN		
GRASS HEIGHT	150	mm
DEPTH OF FLOW (d)	0.3	m
LONGITUDINAL SLOPE (s)	0.005	m/m
manning (n)	0.063	
trapezoid swale		
top width (W)	3	m
bottom width (b)	1	m
depth of swale (d)	0.3	m
z=e/d	3.3	
cross section area (A)	0.6	m2
hydraulic radius (R)	0.27	
Design flow Q	0.28	m3
Design velocity flow V	0.46	m/s
swale length	250.0	m

MAVEN ASSOCIATES	Job Number 117019	Sheet 1	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title SW QUALITY CALS	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98		0.00
C	Grass (landscape and gardens)	74	2.8	207.20
				0.00
				0.00
				0.00
* from Appendix B		Totals =	2.8000	207.20

WQV

CN (weighted) = total product / total area = 207.20 / 2.800 = 74.0

Ia (weighted) = 5 x pervious area / total area = 5 x 2.8 / 2.800 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2)

Catchment length L = 0.5 km (along drainage path)

Catchment Slope Sc= 0.005 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 1 0.63 1.34 4.90 = 0.582 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.390 hrs

OK
use
0.5819472 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES		Job Number 117019	Sheet 2	Rev A
Job Title	2581 SH1 RUAKAKA	Author	Date	Checked
Calc Title	SW QUALITY CALS	KH	22/09/2020	LC

1. Data

Catchment Area	A=	0.028	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=	0.5819472	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 89 mm

3. Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4. 24 hour rainfall depth, P24		32.9	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.114	
6. Specific peak flow rate q*		0.036	
7. Peak flow rate, $q_p=q^*A^*P_{24}$		**0.033**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		6.6	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$		186.06	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 3	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98	2.8	274.40
C	Grass (landscape and gardens)	74	0	0.00
				0.00
				0.00
				0.00
* from Appendix B		Totals =	2.8000	274.40

WQV

CN (weighted) = total product / total area = 274.40 / 2.800 = 98.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.0 / 2.800 = 0.0 mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.5 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 98.0 / (200- 98.0) = 0.96

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

= 0.1 0.6 0.63 1.02 4.90 = 0.266 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.178 hrs

OK
use
0.2663571 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 4	Rev A
Job Title / Calc Title: 2581 SH1 RUAKAKA / Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.028	km2(100ha =1km2)
Runoff curve number	CN=	98.0	(from worksheet 1)
Initial abstraction	Ia=	0.0	mm (from worksheet 1)
Time of concentration	tc=	0.266357077	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 5 mm

3.	Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4.	24 hour rainfall depth, P24		36.7	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.780	
6.	Specific peak flow rate q*		0.158	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$		**0.162**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		32.1	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$		899.50	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**186.06**	(m3)
Post development run off volume	**899.50**	(m3)
Pre development flow rate	**0.03**	(m3/s)
Post development flow rate	**0.16**	(m3/s)
Detention Volume Required	**713.44**	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 1	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title SW QUALITY CALS CATCHMENT A	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98	0	0.00
C	Grass (landscape and gardens)	74	0.0944	6.99
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.0944	6.99

WQV

CN (weighted) = total product / total area = 6.99 / 0.094 = 74.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.1 / 0.094 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2)

Catchment length L = 0.1 km (along drainage path)

Catchment Slope Sc= 0.005 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 1 0.22 1.34 4.90 = 0.201 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.135 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 2	Rev A
Job 2581 SH1 RUAKAKA Calc SW QUALITY CALS CATCHMENT A	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.000944	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 mm

3. Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4. 24 hour rainfall depth, P24		32.9	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.114	
6. Specific peak flow rate q*		0.036	
7. Peak flow rate, $q_p=q^*A^*P_{24}$		**0.001**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		6.6	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$		6.27	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 3	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98	0.0944	9.25
C	Grass (landscape and gardens)	74	0	0.00
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.0944	9.25

WQV

CN (weighted) = total product / total area = 9.25 / 0.094 = 98.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.0 / 0.094 = 0.0 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= 0.005 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 98.0 / (200- 98.0) = 0.96

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

= 0.1 0.6 0.22 1.02 4.90 = 0.092 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.062 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 4	Rev A
Job Title / Calc Title: 2581 SH1 RUAKAKA / Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.000944	km2(100ha =1km2)
Runoff curve number	CN=	98.0	(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 = 5 mm

3.	Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4.	24 hour rainfall depth, P24		36.7	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.780	
6.	Specific peak flow rate q*		0.158	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$		**0.005**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		32.1	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$		30.33	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**6.27**	(m3)
Post development run off volume	**30.33**	(m3)
Pre development flow rate	**0.00**	(m3/s)
Post development flow rate	**0.01**	(m3/s)
Detention Volume Required	**24.05**	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 1	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title SW QUALITY CALS CATCHMENT B	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98		0.00
C	Grass (landscape and gardens)	74	0.0517	3.83
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.0517	3.83

WQV

CN (weighted) = total product / total area = 3.83 / 0.052 = 74.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.1 / 0.052 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2)

Catchment length L = 0.1 km (along drainage path)

Catchment Slope Sc= 0.005 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 1 0.22 1.34 4.90 = 0.201 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.135 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 2	Rev A
Job 2581 SH1 RUAKAKA Calc SW QUALITY CALS CATCHMENT B	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.000517	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 mm

3. Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4. 24 hour rainfall depth, P24		32.9	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.114	
6. Specific peak flow rate q*		0.036	
7. Peak flow rate, $q_p=q^*A^*P_{24}$		**0.001**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		6.6	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$		3.44	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 3	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98	0.0517	5.07
C	Grass (landscape and gardens)	74	0	0.00
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.0517	5.07

WQV

CN (weighted) = total product / total area = 5.07 / 0.052 = 98.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.0 / 0.052 = 0.0 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= 0.005 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 98.0 / (200- 98.0) = 0.96

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

= 0.1 0.6 0.22 1.02 4.90 = 0.092 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.062 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 4	Rev A
Job Title / Calc Title: 2581 SH1 RUAKAKA / Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.000517	km2(100ha =1km2)
Runoff curve number	CN=	98.0	(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 = 5 mm

3.	Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4.	24 hour rainfall depth, P24		36.7	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.780	
6.	Specific peak flow rate q*		0.158	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$		**0.003**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		32.1	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$		16.61	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**3.44**	(m3)
Post development run off volume	**16.61**	(m3)
Pre development flow rate	**0.00**	(m3/s)
Post development flow rate	**0.00**	(m3/s)
Detention Volume Required	**13.17**	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 1	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title SW QUALITY CALS CATCHMENT B	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98		0.00
C	Grass (landscape and gardens)	74	0.021	1.55
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.0210	1.55

WQV

CN (weighted) = total product / total area = 1.55 / 0.021 = 74.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.0 / 0.021 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2)

Catchment length L = 0.03 km (along drainage path)

Catchment Slope Sc= 0.005 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 1 0.10 1.34 4.90 = 0.091 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.061 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 2	Rev A
Job 2581 SH1 RUAKAKA Calc SW QUALITY CALS CATCHMENT B	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.00021	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 mm

3. Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)
4. 24 hour rainfall depth, P24		32.9	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.114	
6. Specific peak flow rate q*		0.036	
7. Peak flow rate, $q_p=q^*A^*P_{24}$		**0.000**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		6.6	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$		1.40	(m3)

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 117019	Sheet 3	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

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	Paved (concrete, gravel, metal, etc)	98	0.021	2.06
C	Grass (landscape and gardens)	74	0	0.00
				0.00
				0.00
				0.00
* from Appendix B		Totals =	0.0210	2.06

WQV

CN (weighted) = total product / total area = 2.06 / 0.021 = 98.0

Ia (weighted) = 5 x pervious area / total area = 5 x 0.0 / 0.021 = 0.0 mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2)

Catchment length L = 0.03 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 98.0 / (200- 98.0) = 0.96

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

= 0.1 0.6 0.10 1.02 4.90 = 0.042 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.028 hrs

NO GOOD
use
0.17 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

MAVEN ASSOCIATES	Job Number 117019	Sheet 4	Rev A
Job Title 2581 SH1 RUAKAKA Calc Title Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

1. Data

Catchment Area	A=	0.00021	km2(100ha =1km2)
Runoff curve number	CN=	98.0	(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 = 5 mm

3.	Average recurrence interval, ARI	WQV	1/3 OF 2	(yr)	
4.	24 hour rainfall depth, P24		36.7	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.780		
6.	Specific peak flow rate q*		0.158		***HEC-HMS Check***
7.	Peak flow rate, $q_p=q^*A^*P_{24}$		**0.001**		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		32.1		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$		6.75	(m3)	
	Pre development run off volume		**1.40**	(m3)	
	Post development run off volume		**6.75**	(m3)	
	Pre development flow rate		**0.00**	(m3/s)	
	Post development flow rate		**0.00**	(m3/s)	
	Detention Volume Required		**5.35**	(m3)	

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES		Job Number 117019	Sheet 5	Rev A
Job Title Calc Title	2581 SH1 RUAKAKA Post-development SW Demand	Author KH	Date 22/09/2020	Checked LC

Rain Garden design

	WQV VOLUME (m3)	df (m)	k	h (m)	tf (day)	RG area (m2)
CATCHMENT A	30.33	1	0.3	0.11	1	91.1
CATCHMENT B	16.61	1	0.3	0.11	1	49.9
CATCHMENT M	6.75	1	0.3	0.11	1	20.3
whole catchment	900.00	1	0.3	0.11	1	2702.7