	MAVE	EN ASSO	OCIATES	Job Number 117019		Sheet 1	Rev A
Job Title Calc Title	2 SW QUA	581 SH1 RU/ LITY CALS C	AKAKA CATCHMENT B	Aut K	thor (H	Date 22/09/2020	Checked LC
1. Runoff Curve	e Number (C	CN) and initi	al Abstraction (la)				
Soil name and classification	Cover desc	ription (cove	r type, treatment, an condition)	d hydrologic	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
C	F	Paved (concr	ete, gravel, metal, et	ic)	98		0.00
C		Grass (land	Iscape and gardens)		74	0.2014	14.90
							0.00
							0.00
+ C A II						0.0044	0.00
* from Appendix	В			WQV	l otals =	0.2014	14.90
CN (weighted) =	total produc total area	<u>et</u> =	<u> </u>	=	74.0		
la (weighted) =	<u>5 x pervious</u> total area	<u>s area</u> =	<u> </u>	0.2	5.0	mm	
2. Time of Cond	centration						
Channelisation f	actor	C =	1	(From Table	e 4.2)		
Catchment lengt	th	L =	0.3	km (along d	rainage path))	
Catchment Slop	e	Sc=	0.005	m/m (by equ	ual area meth	nod)	
Runoff factor.	CN	=	74.0	=	0.59		
,	200 - CN	200	- 74.0				
t _c = 0.14 C L ^{0.66}	(CN/200-CN) ^{-0.55} Sc ^{-0.30}					
= 0	1	0.45	5 1.34	4.90	=	0.415	hrs
SCS Lag for HE	C-HMS	$t_{p} = 2/3 t_{c}$			=	0.278	hrs
						OK	
						0.4153971	hrs
	Wor	rksheet 1: R	unoff Parameters a	nd Time of	Concentratio	on	

M		TES)	Job Number 117019		Sheet 2	Rev A
Jol Ca	2581 SH1 RUAKAKA SW QUALITY CALS CATCHME	NT B		Author KH		Date 22/09/2020	Checked LC
 1. 2. 3. 4. 5. 6. 7. 8. 9. 	Data Catchment Area Runoff curve number Initial abstraction Time of concentration Calculate storage, S =(1000/CN - 10)25.4 Average recurrence interval, ARI 24 hour rainfall depth, P24 Compute c* = P24 - 2la/P24 - 2la+2S Specific peak flow rate q* Peak flow rate, q _p =q*A*P ₂₄ Runoff depth, Q ₂₄ = (P ₂₄ -la) ² /(P ₂₄ -la)+S Runoff volume, V ₂₄ = 1000xQ ₂₄ A	A= CN= Ia= tc=	0.002014 74.0 5.0 0.4153971 WQV	km2(100ha =1km2) (from worksheet 1) mm (from worksheet 1 = <u>1/3 OF 2</u> (yr) <u>32.9</u> (mm) <u>0.114</u> 0.036 <u>0.002</u> (m3/s) <u>6.6</u> 13.38 (m3)	1) 1) 89	mm	
	Worksh	neet 2	: Graphical	Peak Flow Rate			

MAEN	MAVEN ASSO	CIATES	Job N 117	umber 7019	Sheet 3	Rev A
Job Title Calc Title	2581 SH1 RUAK/ Post-development SW	AKA / Demand	Aut K	thor (H	Date 22/09/2020	Checked LC
1. Runoff Curve	Number (CN) and initial <i>i</i>	Abstraction (la)				
Soil name and classification	Cover description (c	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area		
С	Paved (concret	e, gravel, metal, e	tc)	98	0.2014	19.74
<u>с</u>	Grass (lands)	cape and gardens)	74	0	0.00
						0.00
						0.00
* from Appendix F	3			I Totals =	0 2014	19 74
			WQV	rotaio	0.2011	10.11
CN (weighted) =	total product = total area	<u>19.74</u> 0.201	=	98.0		
la (weighted) =	<u>5 x pervious area</u> = total area	5 x 0.201	0.0	0.0	mm	
2. Time of Conce	entration					
Channelisation fa	ctor C =	0.6	(From Table	e 4.2)		
Catchment length	L =	0.3	km (along d	rainage path)	
Catchment Slope	Sc=	0.005	m/m (by equ	ual area meth	nod)	
Runoff factor	CN =	98.0	=	0.96		
	200 - CN 200-	98.0		0.00		
$t_c = 0.14 \text{ C L}^{0.66}$ (0	CN/200-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. Run	off Parameters a	nd Time of (Concentratio	n	

	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)		
	Initial abstraction la= 0.0) (from worksneet 1)) 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	<u>36.7</u> (mm)		
5.	Compute c* = P24 - 2la/P24 - 2la+2S	0.780		
6.	Specific peak flow rate q*	0.158	HEC-HMS Ch	eck
7.	Peak flow rate, q _p =q*A*P ₂₄	0.012		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	32.1		
9.	Runoff volume, $V_{24} = 1000 x Q_{24} A$	64.70 (m3)		
	Pre development run off volume Post development run off volume	13.38 (m3) 64.70 (m3)		
	Pre development flow rate	0.00 (m3/s)		
	Post development now rate	U.U1 (m3/s)		
	Detention Volume Required	51.32 (m3)		
	Worksheet 2: Graphical F	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
SWALE DESIGN	450			
	150 mm			
	0.3 m			
manning (n)	0.063			
trapezoid swale	0.005			
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 ASS	OCIATES	Job N 117	umber '019	Sheet 1	Rev A
Job Title Calc Title	2581 SH1 RU SW QUALITY	AKAKA (CALS	Author KH		Date 22/09/2020	Checked LC
1. Runoff Curve	Number (CN) and initia	Il Abstraction (Ia)				
Soil name and classification	Cover description (cover	type, treatment, an ondition)	d hydrologic	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
C	Paved (concre	ete, gravel, metal, et	c)	98		0.00
C	Grass (lands	scape and gardens)		74	2.8	207.20
						0.00
						0.00
* from Appendix	В			Totals =	2,8000	207.20
	-		WQV			
CN (weighted) =	total product = total area	<u>207.20</u> 2.800	=	74.0		
la (weighted) =	<u>5 x pervious area</u> = total area	<u> </u>	2.8	5.0	mm	
2. Time of Cond	centration					
Channelisation f	actor C =	1	(From Table	4.2)		
Catchment lengt	th L=	0.5	km (along d	rainage path))	
Catchment Slop	e Sc=	0.005	m/m (by equ	ıal area meth	nod)	
Runoff factor	CN =	74 0	=	0.59		
	200 - CN 200-	74.0		0.00		
t _c = 0.14 C L ^{0.66}	(CN/200-CN) ^{-0.55} Sc ^{-0.30}					
= 0	1 0.63	1.34	4.90	=	0.582	hrs
SCS Lag for HE	C-HMS $t_p = 2/3 t_c$			=	0.390	hrs
					OK	
					use	
					0.5819472	hrs
	Worksheet 1: Ru	inoff Parameters a	nd Time of	Concentratio	on	

N		CIA	TES	Job Number 117019		Sheet 2	Rev A
Jo Ca	b Title 2581 SH1 RUAKA Ic Title SW QUALITY CA	AKA Als		Author KH		Date 22/09/2020	Checked LC
 1. 2. 3. 4. 5. 6. 7. 8. 9. 	Data Catchment Area Runoff curve number Initial abstraction Time of concentration Calculate storage, S =(1000/CN - 10)25.4 Average recurrence interval, ARI 24 hour rainfall depth, P24 Compute c* = P24 - 2la/P24 - 2la+2S Specific peak flow rate q* Peak flow rate, q _p =q*A*P ₂₄ Runoff depth, Q ₂₄ = (P ₂₄ -la) ² /(P ₂₄ -la)+S Runoff volume, V ₂₄ = 1000xQ ₂₄ A	A= CN= Ia= tc=	0.028 74.0 5.0 0.5819472 WQV	km2(100ha =1km2) (from worksheet 1) mm (from worksheet hrs (from worksheet = 1/3 OF 2 (yr) 0.114 0.036 0.033 (m3/s) 6.6 186.06 (m3)	1) 1) 89	mm	
1	Worksh	ieet 2	: Graphical	reak flow Rate			

Worksheet 2: Graphical Peak Flow Rate

	MAVEN ASSO	OCIATES	Job Number 117019		Sheet 3	Rev A
Job Title Calc Title	2581 SH1 RUA Post-development	AKAKA SW Demand	Aut K	thor H	Date 22/09/2020	Checked LC
1. Runoff Curve	Number (CN) and initial .	Abstraction (la)				
Soil name and classification	Cover description (c	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area		
C	Paved (concret	e, gravel, metal, e	tc)	98	2.8	274.40
C	Grass (lands)	cape and gardens)	74	0	0.00
						0.00
						0.00
* from Appendix E	}			Totals =	2.8000	274.40
			WQV			
CN (weighted) =	total product = total area	274.40 2.800	.=	98.0		
la (weighted) =	<u>5 x pervious area</u> = total area	<u>5 x</u> 2.800	0.0	0.0	mm	
2. Time of Conce	entration					
Channelisation fa	ctor C =	0.6	(From Table	4.2)		
Catchment length	L =	0.5	km (along d	rainage path))	
Catchment Slope	Sc=	0.005	m/m (by equ	ual area meth	nod)	
Runoff factor		08.0	_	0.06		
	200 - CN 200-	98.0		0.30		
$t_c = 0.14 \text{ C } L^{0.66}$ (0	CN/200-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
	Workshoot 1. Pur	off Paramotoro o	nd Time of (Concontratio	ND .	
	worksneet 1: Run	on rarameters a	nu nine of 0	Joncentratio	л	

	MAVEN ASS	OCIATE	S	Job Numbe 117019	er	Sheet 4	Rev A
Job Title Calc Title	2581 SH1 RU Post-development	AKAKA SW Demand		Author KH		Date 22/09/2020	Checked LC
1.	Data Catchment Area	A=	0.028	km2(100ha =1km	12)		
	Runoff curve number	CN=	98.0	(from worksheet 1)		
	Initial abstraction	la=	0.0	mm (from worksh	eet 1)		
	Time of concentration	tc= 0.2663	57077	hrs (from workshe	et 1)		
2.	Calculate storage, S =(1000/CN - 1	0)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 Ch	eck
7.	Peak flow rate, $q_p = q^*A^*P_{24}$			0.162			Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}$	-la)+S		32.1			
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$			899.50	(m3)		
	Pre development run off volume Post development run off volume			186.06 899.50	(m3) (m3)		
	Pre development flow rate			0.03	(m3/s) (m3/s)		
	Detention Volume Required			713.44	(m3)		
	Works	heet 2: Grapt	nical Pe	eak Flow Rate			

	MAVE	EN ASSO	OCIATES	Job Number 117019		Sheet 1	Rev A
Job Title Calc Title	2 SW QUA	581 SH1 RUA LITY CALS C	NKAKA ATCHMENT A	Au K	thor H	Date 22/09/2020	Checked LC
1. Runoff Curve	e Number (C	CN) and initi	al Abstraction (la)				
Soil name and classification	Cover desc	ription (cove	r type, treatment, an condition)	d hydrologic	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
С	F	Paved (concr	ete, gravel, metal, et	c)	98	0	0.00
С		Grass (land	scape and gardens)		74	0.0944	6.99
							0.00
							0.00
	_						0.00
* from Appendix	В			WQV	l otals =	0.0944	6.99
CN (weighted) =	total produc total area	<u>-</u>	<u> 6.99</u> 0.094	.=	74.0		
la (weighted) =	<u>5 x pervious</u> total area	<u>s area</u> =	<u> </u>	0.1	5.0	mm	
2. Time of Cond	centration						
Channelisation f	actor	C =	1	(From Table	4.2)		
Catchment lengt	th	L =	0.1	km (along d	rainage path)	
Catchment Slop	е	Sc=	0.005	m/m (by equ	ial area meth	iod)	
Runoff factor	CN	=	74 0	=	0.59		
	200 - CN	200-	- 74.0		0.00		
t _c = 0.14 C L ^{0.66}	(CN/200-CN) ^{-0.55} Sc ^{-0.30}					
= 0	1	0.22	2 1.34	4.90	=	0.201	hrs
SCS Lag for HE	C-HMS	$t_p = 2/3 t_c$			=	0.135	hrs
						NO GOOD	
						use	
						0.17	hrs
	Wor	rksheet 1: R	unoff Parameters a	nd Time of	Concentratio	on	

Μ		TES		Job Number 117019		Sheet 2	Rev A
Jol Ca	2581 SH1 RUAKAKA SW QUALITY CALS CATCHM	ENT A		Author KH		Date 22/09/2020	Checked LC
 1. 2. 3. 4. 5. 6. 7. 8. 9. 	Data Catchment Area Runoff curve number Initial abstraction Time of concentration Calculate storage, S =(1000/CN - 10)25.4 Average recurrence interval, ARI 24 hour rainfall depth, P24 Compute $c^* = P24 - 2la/P24 - 2la+2S$ Specific peak flow rate q^* Peak flow rate, $q_p=q^*A^*P_{24}$ Runoff depth, $Q_{24} = (P_{24}-la)^2/(P_{24}-la)+S$ Runoff volume, $V_{24} = 1000xQ_{24}A$	A= CN= Ia= tc=	0.000944 74.0 5.0 0.17	km2(100ha =1km2) (from worksheet 1) mm (from worksheet 1) = 1/3 OF 2 (yr) 32.9 (mm) 0.114 0.036 6.6 6.27 (m3)) 89	mm	
	Works	heet 2	: Graphical	Peak Flow Rate			

	MAVEN AS	SSOCIA	ATES	Job N 117	umber ′019	Sheet 3	Rev A
Job Title Calc Title	2581 SH1 Post-developm	RUAKAKA ient SW Den	nand	Aut K	thor (H	Date 22/09/2020	Checked LC
1. Runoff Curve	Number (CN) and	initial Abst	raction (la)				
Soil name and classification	and Cover description (cover type, treatment on hydrologic condition) Paved (concrete, gravel, metal, etc)				Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
С	Paved (concrete, gr	avel, metal, e	tc)	98	0.0944	9.25
С	Grass (landscape and gardens)				74	0	0.00
							0.00
							0.00
* from Appendix F	<u> </u> }				I Totals =	0 0944	9.25
				WQV	rotaio	0.0011	0.20
CN (weighted) =	total product = total area		9.25 0.094	=	98.0		
la (weighted) =	<u>5 x pervious area</u> total area	=	<u>5 x</u> 0.094	0.0	0.0	mm	
2. Time of Conce	entration						
Channelisation fa	ctor C =		0.6	(From Table	e 4.2)		
Catchment length	L =		0.1	km (along d	rainage path)	
Catchment Slope	Sc=		0.005	m/m (by equ	ual area meth	nod)	
Runoff factor	CN =		98.0	=	0.96		
	200 - CN	200-	98.0		0.00		
$t_c = 0.14 \text{ C } L^{0.66}$ (0	CN/200-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
	Workshoot	1. Runoff E	Darametore a	nd Time of (Concentratio	n	
	worksneet	1. RUHOIT F	arameters a		Soncentratio	711	

	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= 0.000	0944	km2(100ha =1km2)		
	Runoff curve number CN=	98.0	(from worksheet 1)		
	Initial abstraction la=	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		<u>36.7</u> (mm)		
5.	Compute c* = P24 - 2la/P24 - 2la+2S		0.780		
6.	Specific peak flow rate q*		0.158	HEC-HMS Ch	eck
7.	Peak flow rate, q _p =q*A*P ₂₄		0.005		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		32.1		
9.	Runoff volume, $V_{24} = 1000 x Q_{24} A$		30.33 (m3)		
	Pre development run off volume Post development run off volume		6.27 (m3) 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: Graphic	cal Po	eak Flow Rate		

	MAVE	EN ASSO	OCIATES	Job Number 117019		Sheet 1	Rev A	
Job Title Calc Title	2 SW QUA	581 SH1 RUA LITY CALS C	NKAKA ATCHMENT B	Au K	thor H	Date 22/09/2020	Checked LC	
1. Runoff Curve	e Number (C	CN) and initi	al Abstraction (la)					
Soil name and classification	Cover desc	ription (cove	r type, treatment, an condition)	d hydrologic	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area	
C	F	Paved (concr	ete, gravel, metal, et	ic)	98		0.00	
С		Grass (land	scape and gardens)		74	0.0517	3.83	
							0.00	
							0.00	
* from Appondix					Totolo -	0.0517	0.00	
	D			WOV	TOLAIS -	0.0517	3.03	
				VV QV				
CN (weighted) =	total produc total area	<u>-</u>	<u>3.83</u> 0.052	.=	74.0			
la (weighted) =	<u>5 x pervious</u> total area	<u>s area</u> =	<u> </u>	0.1	. 5.0	mm		
2. Time of Cond	centration							
Channelisation f	actor	C =	1	(From Table	e 4.2)			
Catchment lengt	th	L =	0.1	km (along d	rainage path)		
Catchment Slop	e	Sc=	0.005	m/m (by equ	ial area meth	nod)		
Runoff factor	CN	_	74.0	_	0 50			
	200 - CN	200-	- 74.0		0.00			
$t_c = 0.14 \text{ C L}^{0.66}$	(CN/200-CN) ^{-0.55} Sc ^{-0.30}						
= 0	1	0.22	2 1.34	4.90	=	0.201	hrs	
SCS Lag for HE	C-HMS	$t_p = 2/3 t_c$			=	0.135	hrs	
						NO GOOD		
						use		
						0.17	hrs	
	Worksheet 1: Runoff Parameters and Time of Concentration							

M		TES		Job Number 117019		Sheet 2	Rev A
Jo Ca	Jol 2581 SH1 RUAKAKA Cal SW QUALITY CALS CATCHMENT B		Author KH		Date 22/09/2020	Checked LC	
 1. 2. 3. 4. 5. 6. 7. 8. 9. 	Data Catchment Area Runoff curve number Initial abstraction Time of concentration Calculate storage, S =(1000/CN - 10)25.4 Average recurrence interval, ARI 24 hour rainfall depth, P24 Compute c* = P24 - 2la/P24 - 2la+2S Specific peak flow rate q* Peak flow rate, q _p =q*A*P ₂₄ Runoff depth, Q ₂₄ = (P ₂₄ -la) ² /(P ₂₄ -la)+S Runoff volume, V ₂₄ = 1000xQ ₂₄ A	A= CN= la= tc=	0.000517 74.0 5.0 0.17	km2(100ha =1km2) (from worksheet 1) mm (from worksheet 1 hrs (from worksheet 1 = <u>1/3 OF 2</u> (yr) <u>32.9</u> (mm) <u>0.114</u> 0.036 <u>0.001</u> (m3/s) <u>6.6</u> <u>3.44</u> (m3)	1)) 89	mm	
	Works	heet 2:	Graphical	Peak Flow Rate			

MAEN	MAVEI	N ASSO	ASSOCIATES Job Number 117019		umber '019	Sheet 3	Rev A
Job Title Calc Title	258 Post-dev	31 SH1 RUAK/ velopment SW	AKA / Demand	Aut K	thor (H	Date 22/09/2020	Checked LC
1. Runoff Curve	Number (CN) and initial	Abstraction (la)				
Soil name and classification	Cover	description (c hydrolog	cover type, treatme gic condition)	ent, and	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
С	Pa	aved (concret	te, gravel, metal, e	etc)	98	0.0517	5.07
С		Grass (lands	cape and gardens)	74	0	0.00
							0.00
							0.00
						0.0517	0.00
[*] from Appendix E	5			MOV	l otais =	0.0517	5.07
				VVQV			
CN (weighted) =	total produc total area	t =	<u>5.07</u> 0.052	=	98.0		
la (weighted) =	<u>5 x pervious</u> total area	<u>area</u> =	<u> </u>	0.0	. 0.0	mm	
2. Time of Conce	entration						
Channelisation fac	ctor	C =	0.6	(From Table	4.2)		
Catchment length		L =	0.1	km (along d	rainage path)	
Catchment Slope		Sc=	0.005	m/m (by equ	ual area meth	nod)	
Runoff factor.	CN	=	98.0	=	0.96		
,	200 - CN	200-	98.0				
$t_c = 0.14 \text{ C L}^{0.66}$ (C	CN/200-CN) ⁻⁰	^{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
						use	
						0.17	hrs
	10/04/2	shoot 1. Pro-	off Daramatora a	nd Time of (Concontrotio	Nn	
	Work	sheet 1: Run	off Parameters a	nd Time of (Concentratio	on	

	MAVEN ASSOCIATES	S	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 la=	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 WC	٥v	1/3 OF 2 (yr)		
4.	24 hour rainfall depth, P24		<u>36.7</u> (mm)		
5.	Compute c* = P24 - 2la/P24 - 2la+2S		0.780		
6.	Specific peak flow rate q*		0.158	HEC-HMS Ch	eck
7.	Peak flow rate, q _p =q*A*P ₂₄		0.003		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		32.1		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$		16.61 (m3)		
	Pre development run off volume Post development run off volume		3.44 (m3) 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: Gr	raphical Pe	eak Flow Rate		

	MAVE	EN ASSC	DCIATES	Job Number 117019		Sheet 1	Rev A
Job Title Calc Title	Job Title 2581 SH1 RUAKAKA Calc Title SW QUALITY CALS CATCHMENT B			Aut K	thor (H	Date 22/09/2020	Checked LC
1. Runoff Curve	e Number (C	CN) and initia	al Abstraction (Ia)				
Soil name and classification	Cover desc	ription (cover c	type, treatment, an ondition)	d hydrologic	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
С	F	aved (concre	ete, gravel, metal, et	c)	98		0.00
С		Grass (lands	scape and gardens)		74	0.021	1.55
							0.00
							0.00
+ r A 1						0.0040	0.00
[^] from Appendix	В			WOV	lotais =	0.0210	1.55
				WQV			
CN (weighted) =	total produc	<u>t</u> =	1.55	_=	74.0		
			0.021				
la (weighted) =	5 x pervious	s area =	5 x	0.0	5.0	mm	
	total area		0.021				
2. Time of Cond	centration						
Channelisation f	actor	C =	1	(From Table	e 4.2)		
Catchment lengt	th	L =	0.03	km (along d	rainage path))	
Catchment Slop	е	Sc=	0.005	m/m (by equ	ual area meth	iod)	
Runoff factor.	CN	=	74.0	=	0.59		
	200 - CN	200-	74.0				
$t = 0.14 \text{ C} 1^{0.66}$) ^{-0.55} Sc ^{-0.30}					
		,					
= 0	1	0.10	1.34	4.90	=	0.091	hrs
SCS Lag for HE	C-HMS	$t_p = 2/3 t_c$			=	0.061	hrs
						use	
						0.17	hrs
	Woi	<u>ksheet</u> 1: Ru	unoff Parameters a	<u>nd Tim</u> e of (<u>Concen</u> tratio	on	

M		TES		Job Number 117019		Sheet 2	Rev A
Jo Ca	I 2581 SH1 RUAKAKA SW QUALITY CALS CATCHM	ENT B		Author KH		Date 22/09/2020	Checked LC
 1. 2. 3. 4. 5. 6. 7. 8. 9. 	Data Catchment Area Runoff curve number Initial abstraction Time of concentration Calculate storage, S =(1000/CN - 10)25.4 Average recurrence interval, ARI 24 hour rainfall depth, P24 Compute c* = P24 - 2la/P24 - 2la+2S Specific peak flow rate q* Peak flow rate, q _p =q*A*P ₂₄ Runoff depth, Q ₂₄ = (P ₂₄ -la) ² /(P ₂₄ -la)+S Runoff volume, V ₂₄ = 1000xQ ₂₄ A	A= CN= Ia= tc=	0.00021 74.0 5.0 0.17	km2(100ha =1km2) (from worksheet 1) mm (from worksheet 1 = 1/3 OF 2 (yr) 32.9 (mm) 0.114 0.036 0.000 (m3/s) 6.6 1.40 (m3)	1) I) 89	mm	
	Works	heet 2	: Graphical	Peak Flow Rate			

Worksheet 2: Graphical Peak Flow Rate

MAEN	MAVE	AVEN ASSOCIATES		Job N 117	umber '019	Sheet 3	Rev A
Job Title Calc Title	258 Post-dev	31 SH1 RUAK/ velopment SW	AKA / Demand	Author KH			Checked LC
1. Runoff Curve	Number (CN) and initial	Abstraction (la)				
Soil name and classification	Cover	description (c hydrolog	cover type, treatme gic condition)	ent, and	Curve Number CN*	Area (ha) 10000m2= 1ha	Product of CN x area
С	Pa	aved (concret	te, gravel, metal, e	tc)	98	0.021	2.06
С		Grass (lands	cape and gardens)	74	0	0.00
							0.00
							0.00
* for any Annual in F					T - 4 - 1 -	0.0040	0.00
" from Appendix E	5			MOV	i otais =	0.0210	2.06
				WQV			
CN (weighted) =	total produc total area	<u>t</u> =	2.06 0.021	=	98.0		
la (weighted) =	<u>5 x pervious</u> total area	<u>area</u> =	<u> </u>	0.0	0.0	mm	
2. Time of Conce	entration						
Channelisation fa	ctor	C =	0.6	(From Table	4.2)		
Catchment length	I	L =	0.03	km (along d	rainage path)	
Catchment Slope		Sc=	0.005	m/m (by equ	ial area meth	nod)	
Runoff factor	CN	_	08.0	_	0.06		
	200 - CN	200-	98.0	_	0.30		
$t_c = 0.14 \text{ C } L^{0.66}$ (0	CN/200-CN) ⁻⁰	^{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
						use	
						0.17	hrs
	Work	sheet 1: Run	off Parameters a	nd Time of (Concentratio	on	

	MAVEN ASSOCIATES			Job Numbe 117019	er	Sheet 4	Rev A
Job Title Calc Title	2581 SH1 RUAKAKA Post-development SW De	A emand		Author KH		Date 22/09/2020	Checked LC
1.	Data Catchment Area	A=	0.00021	km2(100ha =1km	12)		
	Runoff curve number C	CN=	98.0	(from worksheet 1)		
	Initial abstraction	la=	0.0	mm (from workshe	eet 1)		
	Time of concentration	tc=	0.17	hrs (from workshe	et 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 - 2la/P24 - 2la+2S	;		0.780			
6.	Specific peak flow rate q*			0.158		HEC-HMS Ch	eck
7.	Peak flow rate, q _p =q*A*P ₂₄			0.001			Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)^2$	a)+S		32.1			
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$			6.75	(m3)		
	Pre development run off volume Post development run off volume			1.40 6.75	(m3) (m3)		
	Pre development flow rate			0.00	(m3/s)		
	Post development flow rate			0.00	(m3/s)		
	Detention Volume Required			5.35	(m3)		
	Workshe	et 2: Gra	phical Pe	eak Flow Rate			

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Calc Title	Post-development SW Demand	KH	22/09/2020	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