Form C Attachment A-2

Tables and Calculations

TABLE I – DISCHARGE POINT INFORMATION & DISCHARGE QUANTITY

Discharge Point	LOCATION	Latitude	Longitude	Class	C	I (in/hr)	A (Acres)	Q (cfs)
1	North Makaha Stream	21.47723D	158.21997D	2	0.52	3.285	0.69	1.17
2	North Makaha Stream	21.47716D	158.22010D	2	0.53	3.285	1.12	1.93
3	Makaha Beach	21.47829D	158.22309D	A	0.54	3.285	4.50	7.98
4	Pacific Ocean	21.48378D	158.23117D	A	0.62	3.285	1.06	2.15
5	Pacific Ocean	21.48662D	158.23038D	A	0.62	3.285	1.03	2.10
6	Pacific Ocean	21.48908D	158.23022D	A	0.59	3.285	0.58	1.12
7	Pacific Ocean	21.49541D	158.23006D	A	0.62	3.285	3.20	6.50
8	Keaau Stream	21.49672D	158.22897D	2	0.62	3.285	0.30	0.61
9	Keaau Stream	21.49670D	158.22912D	2	0.62	3.285	0.30	0.61
10	Keaau Stream	21.49677D	158.22898D	2	0.61	3.285	1.72	3.47
11	Keaau Stream	21.49675D	158.22912D	2	0.58	3.285	1.41	2.69
12	Waikomo Stream	21.50533D	158.22912D	2	0.62	3.285	0.65	1.33
13	Waikomo Stream	21.50534D	158.22926D	2	0.62	3.285	0.65	1.33
14	Waikomo Stream	21.50561D	158.22908D	2	0.63	3.285	0.36	0.75
15	Waikomo Stream	21.50564D	158.22922D	2	0.70	3.285	0.30	0.69
16	Pacific Ocean	21.50804D	158.22930D	A	0.61	3.285	0.70	1.40
17	Pacific Ocean	21.51481D	158.22892D	A	0.60	3.285	5.40	10.64
18	Pacific Ocean	21.52283D	158.22856D	A	0.52	3.285	2.95	5.08
19	Kaiahi Gulch	21.52712D	158.22757D	2	0.49	3.285	2.70	4.34
20	Kaiahi Gulch	21.52712D	158.22769D	2	0.48	3.285	2.70	4.24
21	Makua Stream	21.53029D	158.22765D	2	0.47	3.285	0.88	1.36
22	Makua Stream	21.53023D	158.22776D	2	0.53	3.285	0.64	1.12

Discharge Point	LOCATION	Latitude	Longitude	Class	C	I (in/hr)	A (Acres)	Q (cfs)
23	Punapohaku Stream	21.53450D	158.22844D	2	0.46	3.285	1.50	2.27
24	Punapohaku Stream	21.53446D	158.22855D	2	0.59	3.285	1.65	3.20
25	Pacific Ocean	21.53635D	158.23114D	A	0.53	3.285	1.80	3.15
26	Pacific Ocean	21.53718D to 21.53865D	158.23153D to 158.23262D	A	0.60	3.285	0.50	0.99
27	Pacific Ocean	21.53865D	158.23262D	A	0.47	3.285	0.53	0.82
28	Pacific Ocean	21.53865D to 21.53932D	158.23262D to 158.23359D	A	0.43	3.285	0.69	0.98
29	Pacific Ocean	21.53932D	158.23359D	A	0.46	3.285	0.76	1.14
30	Pacific Ocean	21.53932D to 21.54020D	158.23359D to 158.23472D	A	0.78	3.285	0.25	0.64
31	Pacific Ocean	21.54020D	158.23472D	A	0.73	3.285	0.28	0.67
32	Pacific Ocean	21.54020D to 21.54110D	158.23472D to 158.23550D	A	0.71	3.285	0.29	0.68
33	Pacific Ocean	21.54110D	158.23550D	A	0.55	3.285	0.48	0.87
34	Pacific Ocean	21.54110D to 21.54196D	158.23550D to 158.23662D	A	0.41	3.285	0.80	1.08
35	Pacific Ocean	21.54196D	158.23662D	A	0.49	3.285	0.95	1.53
36	Pacific Ocean	21.54196D to 21.54344D	158.23662D to 158.23831D	A	0.80	3.285	0.54	1.42
37	Kaluakaula Stream	21.54524D	158.23946D	2	0.63	3.285	0.22	0.45
38	Pacific Ocean	21.54344D to 21.54483D	158.23831D to 158.23997D	A	0.48	3.285	0.96	1.50
39	Pacific Ocean	21.54483D to 21.54677D	158.23997D to 158.24076D	AA	0.41	3.285	0.86	1.16
40	Pacific Ocean	21.54714D	158.24095D	AA	0.49	3.285	1.60	2.56

RUNOFF CALCULATIONS

Given: Area Disturbed 1-1 = 0.69 Acres

Area Disturbed 2-1 = 1.12 Acres

Area Disturbed 3-1 = 0.35 Acres
Area Disturbed 3-2 = 0.25 Acres
Area Disturbed 3-3 = 1.15 Acres
Area Disturbed 3-4 = 2.75 Acres

Area Disturbed 4-1 = 0.34 Acres
Area Disturbed 4-2 = 0.18 Acres
Area Disturbed 4-3 = 0.54 Acres

Area Disturbed 5-1 = 0.62 Acres
Area Disturbed 5-2 = 0.41 Acres

Area Disturbed 6-1 = 0.32 Acres
Area Disturbed 6-2 = 0.26 Acres

Area Disturbed 7-1 = 1.22 Acres
Area Disturbed 7-2 = 0.18 Acres
Area Disturbed 7-3 = 1.62 Acres
Area Disturbed 7-4 = 0.18 Acres

Area Disturbed 8-1 = 0.30 Acres

Area Disturbed 9-1 = 0.30 Acres

Area Disturbed 10-1 = 1.72 Acres

Area Disturbed 11-1 = 1.41 Acres

Area Disturbed 12-1 = 0.65 Acres

Area Disturbed 13-1 = 0.65 Acres

Area Disturbed 14-1 = 0.36 Acres

Area Disturbed 15-1 = 0.30 Acres

Area Disturbed 16-1 = 0.35 Acres
Area Disturbed 16-2 = 0.35 Acres

Area Disturbed 17-1 = 2.68 Acres
Area Disturbed 17-2 = 2.72 Acres

Area Disturbed 18-1 = 1.13 Acres
Area Disturbed 18-2 = 1.82 Acres

Area Disturbed 19-1 = 2.70 Acres

Area Disturbed 20-1 = 2.70 Acres

Area Disturbed 21-1 = 0.88 Acres

Area Disturbed 22-1 = 0.64 Acres

Area Disturbed 23-1 = 1.50 Acres

Area Disturbed 24-1 = 1.65 Acres

Area Disturbed 25-1 = 0.56 Acres
Area Disturbed 25-2 = 1.24 Acres

Area Disturbed 26-1 = 0.50 Acres

Area Disturbed 27-1 = 0.53 Acres

Area Disturbed 28-1 = 0.69 Acres

Area Disturbed 29-1 = 0.76 Acres

Area Disturbed 30-1 = 0.25 Acres

Area Disturbed 31-1 = 0.28 Acres

Area Disturbed 32-1 = 0.29 Acres

Area Disturbed 33-1 = 0.48 Acres

Area Disturbed 34-1 = 0.80 Acres

Area Disturbed 35-1 = 0.95 Acres

Area Disturbed 36-1 = 0.54 Acres

Area Disturbed 37-1 = 0.22 Acres

Area Disturbed 38-1 = 0.96 Acres

Area Disturbed 39-1 = 0.86 Acres

Area Disturbed 40-1 = 1.60 Acres

C = 0.90 (AC Pavement)
C = 0.30 (Grassed Surfaces)

i = (2-yr, 1-hr event) = 1.46 in./hr.

tc (All Areas) = 10 min. (minimum)

Cf (All Areas) = 2.25

I = i x Cf
I=1.46 in/hour x 2.25 = 3.285 in/hour

Since project area is less than 100 acres, the Rational Formula will be used to calculate potential runoff.

Find: Runoff for a 2-yr 1-hr rainfall event (Q)

Solution: Q = C x I x A

Q1-1 = (0.52) x (3.285 in/hr) x (0.69 Acs)
Q1-1 = 1.17 cfs

Q2-1 = (0.53) x (3.285 in/hr) x (1.12 Acs)
Q2-1 = 1.93 cfs

Q3-1 = (0.54) x (3.285 in/hr) x (0.35 Acs)
Q3-1 = 0.62 cfs

Q3-2 = (0.54) x (3.285 in/hr) x (0.25 Acs)
Q3-2 = 0.44 cfs

Q3-3 = (0.54) x (3.285 in/hr) x (1.15 Acs)
Q3-3 = 2.04 cfs

Q3-4 = (0.54) x (3.285 in/hr) x (2.75 Acs)
Q3-4 = 4.88 cfs

Q4-1 = (0.62) x (3.285 in/hr) x (0.34 Acs)
Q4-1 = 0.69 cfs

Q4-2 = (0.62) x (3.285 in/hr) x (0.18 Acs)
Q4-2 = 0.36 cfs

Q4-3 = (0.62) x (3.285 in/hr) x (0.54 Acs)
Q4-3 = 1.10 cfs

Q5-1 = (0.62) x (3.285 in/hr) x (0.62 Acs)
Q5-1 = 1.26 cfs

Q5-2 = (0.62) x (3.285 in/hr) x (0.41 Acs)
Q5-2 = 0.84 cfs

Q6-1 = (0.59) x (3.285 in/hr) x (0.32 Acs)
Q6-1 = 0.62 cfs

Q6-2 = (0.59) x (3.285 in/hr) x (0.26 Acs)
Q6-2 = 0.50 cfs

Q7-1 = (0.62) x (3.285 in/hr) x (1.22 Acs)
Q7-1 = 2.48 cfs

Q7-2 = (0.62) x (3.285 in/hr) x (0.18 Acs)
Q7-2 = 0.36 cfs

Q7-3 = (0.62) x (3.285 in/hr) x (1.62 Acs)
Q7-3 = 3.30 cfs

Q7-4 = (0.62) x (3.285 in/hr) x (0.18 Acs)
Q7-4 = 0.36 cfs

Q8-1 = (0.62) x (3.285 in/hr) x (0.30 Acs)
Q8-1 = 0.61 cfs

Q9-1 = (0.62) x (3.285 in/hr) x (0.30 Acs)
Q9-1 = 0.61 cfs

Q10-1 = (0.61) x (3.285 in/hr) x (1.72 Acs)
Q10-1 = 3.47 cfs

Q11-1 = (0.58) x (3.285 in/hr) x (1.41 Acs)
Q11-1 = 2.69 cfs

Q12-1 = (0.62) x (3.285 in/hr) x (0.65 Acs)
Q12-1 = 1.33 cfs

Q13-1 = (0.62) x (3.285 in/hr) x (0.65 Acs)
Q13-1 = 1.33 cfs

Q14-1 = (0.63) x (3.285 in/hr) x (0.36 Acs)
Q14-1 = 0.75 cfs

Q15-1 = (0.70) x (3.285 in/hr) x (0.30 Acs)
Q15-1 = 0.69 cfs

Q16-1 = (0.61) x (3.285 in/hr) x (0.35 Acs)
Q16-1 = 0.70 cfs

Q16-2 = (0.61) x (3.285 in/hr) x (0.35 Acs)
Q16-2 = 0.70 cfs

Q17-1 = (0.60) x (3.285 in/hr) x (2.68 Acs)
Q17-1 = 5.28 cfs

Q17-2 = (0.60) x (3.285 in/hr) x (2.72 Acs)
Q17-2 = 5.36 cfs

Q18-1 = (0.52) x (3.285 in/hr) x (1.13 Acs)
Q18-1 = 1.94 cfs

Q18-2 = (0.52) x (3.285 in/hr) x (1.82 Acs)
Q18-2 = 3.14 cfs

Q19-1 = (0.49) x (3.285 in/hr) x (2.70 Acs)
Q19-1 = 4.34 cfs

Q20-1 = (0.48) x (3.285 in/hr) x (2.70 Acs)
Q20-1 = 4.24 cfs

Q21-1 = (0.47) x (3.285 in/hr) x (0.88 Acs)
Q21-1 = 1.36 cfs

Q22-1 = (0.53) x (3.285 in/hr) x (0.64 Acs)
Q22-1 = 1.12 cfs

Q23-1 = (0.46) x (3.285 in/hr) x (1.50 Acs)
Q23-1 = 2.27 cfs

Q24-1 = (0.59) x (3.285 in/hr) x (1.65 Acs)
Q24-1 = 3.20 cfs

Q25-1 = (0.53) x (3.285 in/hr) x (0.56 Acs)
Q25-1 = 0.98 cfs

Q25-2 = (0.53) x (3.285 in/hr) x (1.24 Acs)
Q25-2 = 2.17 cfs

Q26-1 = (0.60) x (3.285 in/hr) x (0.50 Acs)
Q26-1 = 0.99 cfs

Q27-1 = (0.47) x (3.285 in/hr) x (0.53 Acs)
Q27-1 = 0.82 cfs

Q28-1 = (0.43) x (3.285 in/hr) x (0.69 Acs)
Q28-1 = 0.98 cfs

Q29-1 = (0.46) x (3.285 in/hr) x (0.76 Acs)
Q29-1 = 1.14 cfs

Q30-1 = (0.78) x (3.285 in/hr) x (0.25 Acs)
Q30-1 = 0.64 cfs

Q31-1 = (0.73) x (3.285 in/hr) x (0.28 Acs)
Q31-1 = 0.67 cfs

Q32-1 = (0.71) x (3.285 in/hr) x (0.29 Acs)
Q32-1 = 0.68 cfs

Q33-1 = (0.55) x (3.285 in/hr) x (0.48 Acs)
Q33-1 = 0.87 cfs

Q34-1 = (0.41) x (3.285 in/hr) x (0.80 Acs)
Q34-1 = 1.08 cfs

Q35-1 = (0.49) x (3.285 in/hr) x (0.95 Acs)
Q35-1 = 1.53 cfs

Q36-1 = (0.80) x (3.285 in/hr) x (0.54 Acs)
Q36-1 = 1.42 cfs

Q37-1 = (0.63) x (3.285 in/hr) x (0.22 Acs)
Q37-1 = 0.45 cfs

Q38-1 = (0.48) x (3.285 in/hr) x (0.96 Acs)
Q38-1 = 1.50 cfs

Q39-1 = (0.41) x (3.285 in/hr) x (0.86 Acs)
Q39-1 = 1.16 cfs

Q40-1 = (0.49) x (3.285 in/hr) x (1.60 Acs)
Q40-1 = 2.56 cfs

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Area Disturbed 17-2 = 2.72 Acres

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Area Disturbed 18-2 = 1.82 Acres

Area Disturbed 19-1 = 2.70 Acres

Area Disturbed 20-1 = 2.70 Acres

Area Disturbed 21-1 = 0.88 Acres

Area Disturbed 22-1 = 0.64 Acres

Area Disturbed 23-1 = 1.50 Acres

Area Disturbed 24-1 = 1.65 Acres

Area Disturbed 25-1 = 0.56 Acres
Area Disturbed 25-2 = 1.24 Acres

Area Disturbed 26-1 = 0.50 Acres

Area Disturbed 27-1 = 0.53 Acres

Area Disturbed 28-1 = 0.69 Acres

Area Disturbed 29-1 = 0.76 Acres

Area Disturbed 30-1 = 0.25 Acres

Area Disturbed 31-1 = 0.28 Acres

Area Disturbed 32-1 = 0.29 Acres

Area Disturbed 33-1 = 0.48 Acres

Area Disturbed 34-1 = 0.80 Acres

Area Disturbed 35-1 = 0.95 Acres

Area Disturbed 36-1 = 0.54 Acres

Area Disturbed 37-1 = 0.22 Acres

Area Disturbed 38-1 = 0.96 Acres

Area Disturbed 39-1 = 0.86 Acres

Area Disturbed 40-1 = 1.60 Acres

C = 0.90 (AC Pavement)
C = 0.30 (Grassed Surfaces)

i = (2-yr, 1-hr event) = 1.46 in./hr.

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Cf (All Areas) = 2.25

I = i x Cf
I=1.46 in/hour x 2.25 = 3.285 in/hour

Since project area is less than 100 acres, the Rational Formula will be used to calculate potential runoff.

Find: Runoff for a 2-yr 1-hr rainfall event (Q)

Solution: Q = C x I x A

Q1-1 = (0.52) x (3.285 in/hr) x (0.69 Acs)
Q1-1 = 1.17 cfs

Q2-1 = (0.53) x (3.285 in/hr) x (1.12 Acs)
Q2-1 = 1.93 cfs

Q3-1 = (0.54) x (3.285 in/hr) x (0.35 Acs)
Q3-1 = 0.62 cfs

Q3-2 = (0.54) x (3.285 in/hr) x (0.25 Acs)
Q3-2 = 0.44 cfs

Q3-3 = (0.54) x (3.285 in/hr) x (1.15 Acs)
Q3-3 = 2.04 cfs

Q3-4 = (0.54) x (3.285 in/hr) x (2.75 Acs)
Q3-4 = 4.88 cfs

Q4-1 = (0.62) x (3.285 in/hr) x (0.34 Acs)
Q4-1 = 0.69 cfs

Q4-2 = (0.62) x (3.285 in/hr) x (0.18 Acs)
Q4-2 = 0.36 cfs

Q4-3 = (0.62) x (3.285 in/hr) x (0.54 Acs)
Q4-3 = 1.10 cfs

Q5-1 = (0.62) x (3.285 in/hr) x (0.62 Acs)
Q5-1 = 1.26 cfs

Q5-2 = (0.62) x (3.285 in/hr) x (0.41 Acs)
Q5-2 = 0.84 cfs

Q6-1 = (0.59) x (3.285 in/hr) x (0.32 Acs)
Q6-1 = 0.62 cfs

Q6-2 = (0.59) x (3.285 in/hr) x (0.26 Acs)
Q6-2 = 0.50 cfs

Q7-1 = (0.62) x (3.285 in/hr) x (1.22 Acs)
Q7-1 = 2.48 cfs

Q7-2 = (0.62) x (3.285 in/hr) x (0.18 Acs)
Q7-2 = 0.36 cfs

Q7-3 = (0.62) x (3.285 in/hr) x (1.62 Acs)
Q7-3 = 3.30 cfs

Q7-4 = (0.62) x (3.285 in/hr) x (0.18 Acs)
Q7-4 = 0.36 cfs

Q8-1 = (0.62) x (3.285 in/hr) x (0.30 Acs)
Q8-1 = 0.61 cfs

Q9-1 = (0.62) x (3.285 in/hr) x (0.30 Acs)
Q9-1 = 0.61 cfs

Q10-1 = (0.61) x (3.285 in/hr) x (1.72 Acs)
Q10-1 = 3.47 cfs

Q11-1 = (0.58) x (3.285 in/hr) x (1.41 Acs)
Q11-1 = 2.69 cfs

Q12-1 = (0.62) x (3.285 in/hr) x (0.65 Acs)
Q12-1 = 1.33 cfs

Q13-1 = (0.62) x (3.285 in/hr) x (0.65 Acs)
Q13-1 = 1.33 cfs

Q14-1 = (0.63) x (3.285 in/hr) x (0.36 Acs)
Q14-1 = 0.75 cfs

Q15-1 = (0.70) x (3.285 in/hr) x (0.30 Acs)
Q15-1 = 0.69 cfs

Q16-1 = (0.61) x (3.285 in/hr) x (0.35 Acs)
Q16-1 = 0.70 cfs

Q16-2 = (0.61) x (3.285 in/hr) x (0.35 Acs)
Q16-2 = 0.70 cfs

Q17-1 = (0.60) x (3.285 in/hr) x (2.68 Acs)
Q17-1 = 5.28 cfs

Q17-2 = (0.60) x (3.285 in/hr) x (2.72 Acs)
Q17-2 = 5.36 cfs

Q18-1 = (0.52) x (3.285 in/hr) x (1.13 Acs)
Q18-1 = 1.94 cfs

Q18-2 = (0.52) x (3.285 in/hr) x (1.82 Acs)
Q18-2 = 3.14 cfs

Q19-1 = (0.49) x (3.285 in/hr) x (2.70 Acs)
Q19-1 = 4.34 cfs

Q20-1 = (0.48) x (3.285 in/hr) x (2.70 Acs)
Q20-1 = 4.24 cfs

Q21-1 = (0.47) x (3.285 in/hr) x (0.88 Acs)
Q21-1 = 1.36 cfs

Q22-1 = (0.53) x (3.285 in/hr) x (0.64 Acs)
Q22-1 = 1.12 cfs

Q23-1 = (0.46) x (3.285 in/hr) x (1.50 Acs)
Q23-1 = 2.27 cfs

Q24-1 = (0.59) x (3.285 in/hr) x (1.65 Acs)
Q24-1 = 3.20 cfs

Q25-1 = (0.53) x (3.285 in/hr) x (0.56 Acs)
Q25-1 = 0.98 cfs

Q25-2 = (0.53) x (3.285 in/hr) x (1.24 Acs)
Q25-2 = 2.17 cfs

Q26-1 = (0.60) x (3.285 in/hr) x (0.50 Acs)
Q26-1 = 0.99 cfs

Q27-1 = (0.47) x (3.285 in/hr) x (0.53 Acs)
Q27-1 = 0.82 cfs

Q28-1 = (0.43) x (3.285 in/hr) x (0.69 Acs)
Q28-1 = 0.98 cfs

Q29-1 = (0.46) x (3.285 in/hr) x (0.76 Acs)
Q29-1 = 1.14 cfs

Q30-1 = (0.78) x (3.285 in/hr) x (0.25 Acs)
Q30-1 = 0.64 cfs

Q31-1 = (0.73) x (3.285 in/hr) x (0.28 Acs)
Q31-1 = 0.67 cfs

Q32-1 = (0.71) x (3.285 in/hr) x (0.29 Acs)
Q32-1 = 0.68 cfs

Q33-1 = (0.55) x (3.285 in/hr) x (0.48 Acs)
Q33-1 = 0.87 cfs

Q34-1 = (0.41) x (3.285 in/hr) x (0.80 Acs)
Q34-1 = 1.08 cfs

Q35-1 = (0.49) x (3.285 in/hr) x (0.95 Acs)
Q35-1 = 1.53 cfs

Q36-1 = (0.80) x (3.285 in/hr) x (0.54 Acs)
Q36-1 = 1.42 cfs

Q37-1 = (0.63) x (3.285 in/hr) x (0.22 Acs)
Q37-1 = 0.45 cfs

Q38-1 = (0.48) x (3.285 in/hr) x (0.96 Acs)
Q38-1 = 1.50 cfs

Q39-1 = (0.41) x (3.285 in/hr) x (0.86 Acs)
Q39-1 = 1.16 cfs

Q40-1 = (0.49) x (3.285 in/hr) x (1.60 Acs)
Q40-1 = 2.56 cfs