

File Ref: 21/055

15 March 2022

DA2021/2064 – HEC RAS Assessment
68 Memorial Avenue Stroud

As per Council's Request For Information (RFI), dated 14/12/2021, there is a second order stream through the development site.

To assess the overland flow, through the site, a HEC RAS assessment has been set up for the 1% AEP flows.

The 1% AEP flow has been calculated at 4.51cumecs.

A manning's n roughness coefficient of 0.05 (long grass) has been adopted through the site and 0.011 (bitumen) has been adopted over the road.

The results of the HEC RAS assessment are attached.

A separate set of plans, drawing number 21055(OF) Rev A, has been prepared showing the flow through the site in plan view and section views. The plan view depicts the width of flow through the site and the section views indicate the water surface level compared to the natural surface levels.

At the piped crossing, 100% blockage has been assumed, to determine the flow over the road in the 1% AEP event. On the upstream side of the road (Ch 3.43), the maximum depth of flow is 0.29m with a velocity of 0.86m/s. This provides a Velocity x Depth (VD) ration of 0.25 which is within safe limits. On the downstream side of the road (Ch 0.00), the maximum depth of flow is 0.24m with a velocity of 1.10m/s. This provides a VD ration of 0.26 which is within safe limits.



Yours sincerely

HDB Town Planning & Design

Rod Fletcher

Civil Designer

Attachments

- HEC RAS summary data
- HEC RAS Section data
- HEC RAS Profile
- HEC RAS Sections



HEC-RAS Plan: Plan 01 River: Overland Flow Reach: 68 Memorial Ave Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
68 Memorial Ave	220	PF 1	4.51	49.95	50.25	50.25	50.36	0.040926	1.50	3.00	13.24	1.01
68 Memorial Ave	200	PF 1	4.51	48.99	49.26	49.26	49.38	0.040450	1.53	2.95	12.59	1.01
68 Memorial Ave	180	PF 1	4.51	48.00	48.34	48.34	48.47	0.038700	1.63	2.77	10.32	1.01
68 Memorial Ave	160	PF 1	4.51	46.97	47.23	47.23	47.34	0.041670	1.46	3.09	14.35	1.01
68 Memorial Ave	140	PF 1	4.51	46.00	46.60		46.67	0.014131	1.24	3.65	9.64	0.64
68 Memorial Ave	120	PF 1	4.51	45.76	46.11	46.11	46.22	0.041277	1.50	3.00	13.31	1.01
68 Memorial Ave	100	PF 1	4.51	44.95	45.30	45.27	45.40	0.027944	1.38	3.26	12.19	0.85
68 Memorial Ave	83.2	PF 1	4.51	44.33	44.71	44.71	44.83	0.041308	1.51	2.99	13.24	1.01
68 Memorial Ave	67	PF 1	4.51	43.70	44.37		44.40	0.007575	0.72	6.30	23.83	0.44
68 Memorial Ave	50	PF 1	4.51	43.82	44.07	44.07	44.13	0.050141	1.05	4.28	37.51	1.00
68 Memorial Ave	39.1	PF 1	4.51	43.22	43.52	43.52	43.60	0.046578	1.25	3.62	23.34	1.01
68 Memorial Ave	25	PF 1	4.51	42.89	43.14		43.16	0.009579	0.59	7.69	46.68	0.46
68 Memorial Ave	15.5	PF 1	4.51	42.65	42.91	42.91	42.98	0.046795	1.20	3.77	25.85	1.00
68 Memorial Ave	4.3	PF 1	4.51	42.27	42.56	42.53	42.60	0.001157	0.86	5.25	35.80	0.72
68 Memorial Ave	0.00	PF 1	4.51	42.29	42.53	42.53	42.59	0.002474	1.10	4.09	33.97	1.01

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 220 Profile: PF 1

E.G. Elev (m)	50.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.050	
W.S. Elev (m)	50.25	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)	50.25	Flow Area (m2)		3.00	
E.G. Slope (m/m)	0.040926	Area (m2)		3.00	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	13.24	Top Width (m)		13.24	
Vel Total (m/s)	1.50	Avg. Vel. (m/s)		1.50	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	22.3	Conv. (m3/s)		22.3	
Length Wtd. (m)	20.00	Wetted Per. (m)		13.28	
Min Ch EI (m)	49.95	Shear (N/m2)		90.78	
Alpha	1.00	Stream Power (N/m s)		136.35	
Frctn Loss (m)	0.81	Cum Volume (1000 m3)		0.83	
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.14	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 200 Profile: PF 1

E.G. Elev (m)	49.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.050	
W.S. Elev (m)	49.26	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)	49.26	Flow Area (m2)		2.95	
E.G. Slope (m/m)	0.040450	Area (m2)		2.95	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	12.59	Top Width (m)		12.59	
Vel Total (m/s)	1.53	Avg. Vel. (m/s)		1.53	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	22.4	Conv. (m3/s)		22.4	
Length Wtd. (m)	20.00	Wetted Per. (m)		12.64	
Min Ch EI (m)	48.99	Shear (N/m2)		92.72	
Alpha	1.00	Stream Power (N/m s)		141.53	
Frctn Loss (m)	0.79	Cum Volume (1000 m3)		0.77	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.88	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 180 Profile: PF 1

E.G. Elev (m)	48.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.050	
W.S. Elev (m)	48.34	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)	48.34	Flow Area (m2)		2.77	
E.G. Slope (m/m)	0.038700	Area (m2)		2.77	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	10.32	Top Width (m)		10.32	
Vel Total (m/s)	1.63	Avg. Vel. (m/s)		1.63	
Max Chl Dpth (m)	0.34	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	22.9	Conv. (m3/s)		22.9	
Length Wtd. (m)	20.00	Wetted Per. (m)		10.37	
Min Ch EI (m)	48.00	Shear (N/m2)		101.21	
Alpha	1.00	Stream Power (N/m s)		164.99	
Frctn Loss (m)	0.80	Cum Volume (1000 m3)		0.72	
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.65	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 160 Profile: PF 1

E.G. Elev (m)	47.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.050	
W.S. Elev (m)	47.23	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)	47.23	Flow Area (m2)		3.09	
E.G. Slope (m/m)	0.041670	Area (m2)		3.09	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 160 Profile: PF 1 (Continued)

Top Width (m)	14.35	Top Width (m)		14.35	
Vel Total (m/s)	1.46	Avg. Vel. (m/s)		1.46	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	22.1	Conv. (m3/s)		22.1	
Length Wtd. (m)	20.00	Wetted Per. (m)		14.40	
Min Ch EI (m)	46.97	Shear (N/m2)		87.56	
Alpha	1.00	Stream Power (N/m s)		128.00	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)		0.66	
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.41	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 140 Profile: PF 1

E.G. Elev (m)	46.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.050	
W.S. Elev (m)	46.60	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)		Flow Area (m2)		3.65	
E.G. Slope (m/m)	0.014131	Area (m2)		3.65	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	9.64	Top Width (m)		9.64	
Vel Total (m/s)	1.24	Avg. Vel. (m/s)		1.24	
Max Chl Dpth (m)	0.60	Hydr. Depth (m)		0.38	
Conv. Total (m3/s)	37.9	Conv. (m3/s)		37.9	
Length Wtd. (m)	20.00	Wetted Per. (m)		9.75	
Min Ch EI (m)	46.00	Shear (N/m2)		51.89	
Alpha	1.00	Stream Power (N/m s)		64.09	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)		0.59	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.17	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 120 Profile: PF 1

E.G. Elev (m)	46.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.050	
W.S. Elev (m)	46.11	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)	46.11	Flow Area (m2)		3.00	
E.G. Slope (m/m)	0.041277	Area (m2)		3.00	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	13.31	Top Width (m)		13.31	
Vel Total (m/s)	1.50	Avg. Vel. (m/s)		1.50	
Max Chl Dpth (m)	0.35	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	22.2	Conv. (m3/s)		22.2	
Length Wtd. (m)	20.00	Wetted Per. (m)		13.35	
Min Ch EI (m)	45.76	Shear (N/m2)		91.01	
Alpha	1.00	Stream Power (N/m s)		136.73	
Frctn Loss (m)	0.67	Cum Volume (1000 m3)		0.52	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.94	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 100 Profile: PF 1

E.G. Elev (m)	45.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.050	
W.S. Elev (m)	45.30	Reach Len. (m)	16.80	16.80	16.80
Crit W.S. (m)	45.27	Flow Area (m2)		3.26	
E.G. Slope (m/m)	0.027944	Area (m2)		3.26	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	12.19	Top Width (m)		12.19	
Vel Total (m/s)	1.38	Avg. Vel. (m/s)		1.38	
Max Chl Dpth (m)	0.35	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	27.0	Conv. (m3/s)		27.0	
Length Wtd. (m)	16.80	Wetted Per. (m)		12.24	
Min Ch EI (m)	44.95	Shear (N/m2)		72.96	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 100 Profile: PF 1 (Continued)

Alpha	1.00	Stream Power (N/m s)		100.96	
Frctn Loss (m)	0.57	Cum Volume (1000 m3)		0.46	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.68	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 83.2 Profile: PF 1

E.G. Elev (m)	44.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.050	
W.S. Elev (m)	44.71	Reach Len. (m)	15.20	15.20	15.20
Crit W.S. (m)	44.71	Flow Area (m2)		2.99	
E.G. Slope (m/m)	0.041308	Area (m2)		2.99	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	13.24	Top Width (m)		13.24	
Vel Total (m/s)	1.51	Avg. Vel. (m/s)		1.51	
Max Chl Dpth (m)	0.38	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	22.2	Conv. (m3/s)		22.2	
Length Wtd. (m)	15.20	Wetted Per. (m)		13.27	
Min Ch EI (m)	44.33	Shear (N/m2)		91.40	
Alpha	1.00	Stream Power (N/m s)		137.70	
Frctn Loss (m)	0.23	Cum Volume (1000 m3)		0.41	
C & E Loss (m)	0.03	Cum SA (1000 m2)		2.47	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 67 Profile: PF 1

E.G. Elev (m)	44.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.050	
W.S. Elev (m)	44.37	Reach Len. (m)	17.00	17.00	17.00
Crit W.S. (m)		Flow Area (m2)		6.30	
E.G. Slope (m/m)	0.007575	Area (m2)		6.30	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	23.83	Top Width (m)		23.83	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.67	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	51.8	Conv. (m3/s)		51.8	
Length Wtd. (m)	17.00	Wetted Per. (m)		23.89	
Min Ch EI (m)	43.70	Shear (N/m2)		19.59	
Alpha	1.00	Stream Power (N/m s)		14.02	
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.34	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.19	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 50 Profile: PF 1

E.G. Elev (m)	44.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.050	
W.S. Elev (m)	44.07	Reach Len. (m)	10.90	10.90	10.90
Crit W.S. (m)	44.07	Flow Area (m2)		4.28	
E.G. Slope (m/m)	0.050141	Area (m2)		4.28	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	37.51	Top Width (m)		37.51	
Vel Total (m/s)	1.05	Avg. Vel. (m/s)		1.05	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	20.1	Conv. (m3/s)		20.1	
Length Wtd. (m)	10.90	Wetted Per. (m)		37.51	
Min Ch EI (m)	43.82	Shear (N/m2)		56.11	
Alpha	1.00	Stream Power (N/m s)		59.12	
Frctn Loss (m)	0.53	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.67	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 39.1 Profile: PF 1

E.G. Elev (m)	43.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.050	
W.S. Elev (m)	43.52	Reach Len. (m)	14.10	14.10	14.10
Crit W.S. (m)	43.52	Flow Area (m2)		3.62	
E.G. Slope (m/m)	0.046578	Area (m2)		3.62	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	23.34	Top Width (m)		23.34	
Vel Total (m/s)	1.25	Avg. Vel. (m/s)		1.25	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	20.9	Conv. (m3/s)		20.9	
Length Wtd. (m)	14.10	Wetted Per. (m)		23.35	
Min Ch EI (m)	43.22	Shear (N/m2)		70.81	
Alpha	1.00	Stream Power (N/m s)		88.21	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.33	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 25 Profile: PF 1

E.G. Elev (m)	43.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.050	
W.S. Elev (m)	43.14	Reach Len. (m)	9.50	9.50	9.50
Crit W.S. (m)		Flow Area (m2)		7.69	
E.G. Slope (m/m)	0.009579	Area (m2)		7.69	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	46.68	Top Width (m)		46.68	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	46.1	Conv. (m3/s)		46.1	
Length Wtd. (m)	9.50	Wetted Per. (m)		46.84	
Min Ch EI (m)	42.89	Shear (N/m2)		15.42	
Alpha	1.00	Stream Power (N/m s)		9.05	
Frctn Loss (m)	0.17	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.84	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 15.5 Profile: PF 1

E.G. Elev (m)	42.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.050	
W.S. Elev (m)	42.91	Reach Len. (m)	11.20	11.20	11.20
Crit W.S. (m)	42.91	Flow Area (m2)		3.77	
E.G. Slope (m/m)	0.046795	Area (m2)		3.77	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	25.85	Top Width (m)		25.85	
Vel Total (m/s)	1.20	Avg. Vel. (m/s)		1.20	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	20.8	Conv. (m3/s)		20.8	
Length Wtd. (m)	11.20	Wetted Per. (m)		25.86	
Min Ch EI (m)	42.65	Shear (N/m2)		66.82	
Alpha	1.00	Stream Power (N/m s)		80.02	
Frctn Loss (m)	0.04	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.50	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 4.3 Profile: PF 1

E.G. Elev (m)	42.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.011	
W.S. Elev (m)	42.56	Reach Len. (m)	4.30	4.30	4.30
Crit W.S. (m)	42.53	Flow Area (m2)		5.25	
E.G. Slope (m/m)	0.001157	Area (m2)		5.25	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 4.3 Profile: PF 1 (Continued)

Top Width (m)	35.80	Top Width (m)		35.80	
Vel Total (m/s)	0.86	Avg. Vel. (m/s)		0.86	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	132.6	Conv. (m3/s)		132.6	
Length Wtd. (m)	4.30	Wetted Per. (m)		35.80	
Min Ch El (m)	42.27	Shear (N/m2)		1.66	
Alpha	1.00	Stream Power (N/m s)		1.43	
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.15	

Plan: Plan 01 Overland Flow 68 Memorial Ave RS: 0.00 Profile: PF 1

E.G. Elev (m)	42.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.011	
W.S. Elev (m)	42.53	Reach Len. (m)			
Crit W.S. (m)	42.53	Flow Area (m2)		4.09	
E.G. Slope (m/m)	0.002474	Area (m2)		4.09	
Q Total (m3/s)	4.51	Flow (m3/s)		4.51	
Top Width (m)	33.97	Top Width (m)		33.97	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	90.7	Conv. (m3/s)		90.7	
Length Wtd. (m)		Wetted Per. (m)		33.97	
Min Ch El (m)	42.29	Shear (N/m2)		2.92	
Alpha	1.00	Stream Power (N/m s)		3.22	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			







