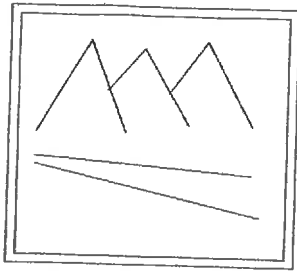


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28 JUN 2016

**PROFESSIONAL GROUND WATER AND ENVIRONMENTAL SERVICES**



- . RESOURCE CONSENTS
- . ASSESSMENT OF EFFECTS
- . WATER RESOURCE EVALUATIONS
- . HYDROGEOLOGIC STUDIES

**GREG BUTCHER (B.Sc)**

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23/6/2016

South Wairarapa District Council  
P O Box 6  
Martinborough

Attention: Bill Sloan

**Re. Featherston wastewater project - Donalds Creek flow monitoring**

Dear Bill

A temporary flow monitoring site has been established on Donalds Creek at a point just upstream of the wastewater discharge location. The site was established on 22/2/2016.

Since the site installation 5 flow gaugings have been completed to rate or calibrate the site. Flow gauging calculation sheets are attached to this letter.

Please find attached:

Figure 1 - a stage hydrograph for the data collected to date

Figure 2 - a flow hydrograph for the data collected to date over the full stage range

Figure 3 - a flow hydrograph for the data collected to date for flows less than 500 litres/second

Figure 4 - the site rating curve as at June 2016

At this stage we have not been able to complete flow gaugings at high stage i.e. at flows greater than about 500 l/s. Therefore please treat higher flow data with caution at this stage as this may be subject to change as we refine the top end of the rating curve. The lower flow data i.e. less than about 500 l/s, should be fairly accurate.

Please note that prior to the middle of May all the flow at the recorder site was coming from the Torohanga Stream tributary, as Donalds Creek upstream of this point was dry.

If you have any queries regarding the enclosed information please don't hesitate to contact me.

Yours faithfully



G M Butcher

Donalds Creek temporary recorder - stage hydrograph

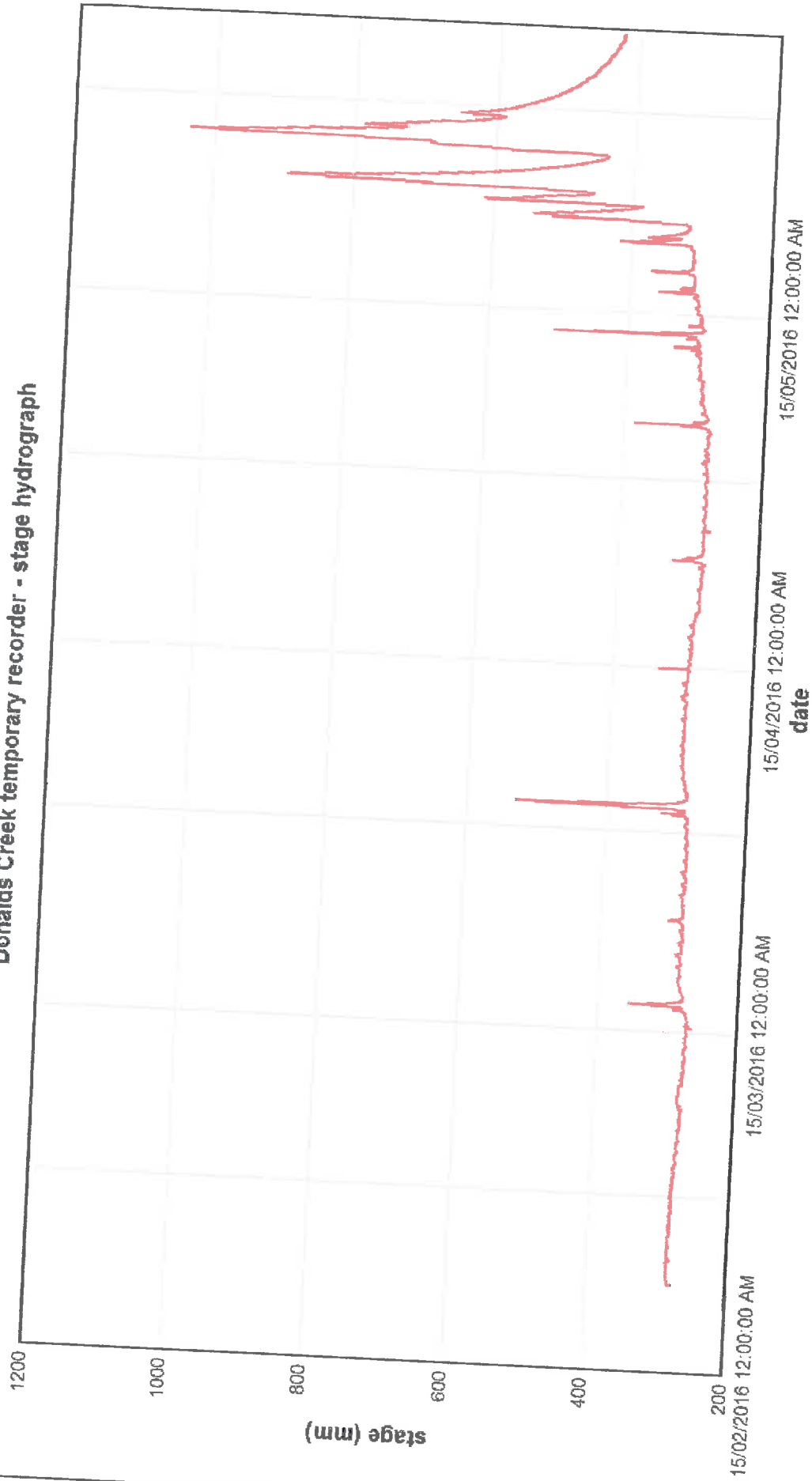
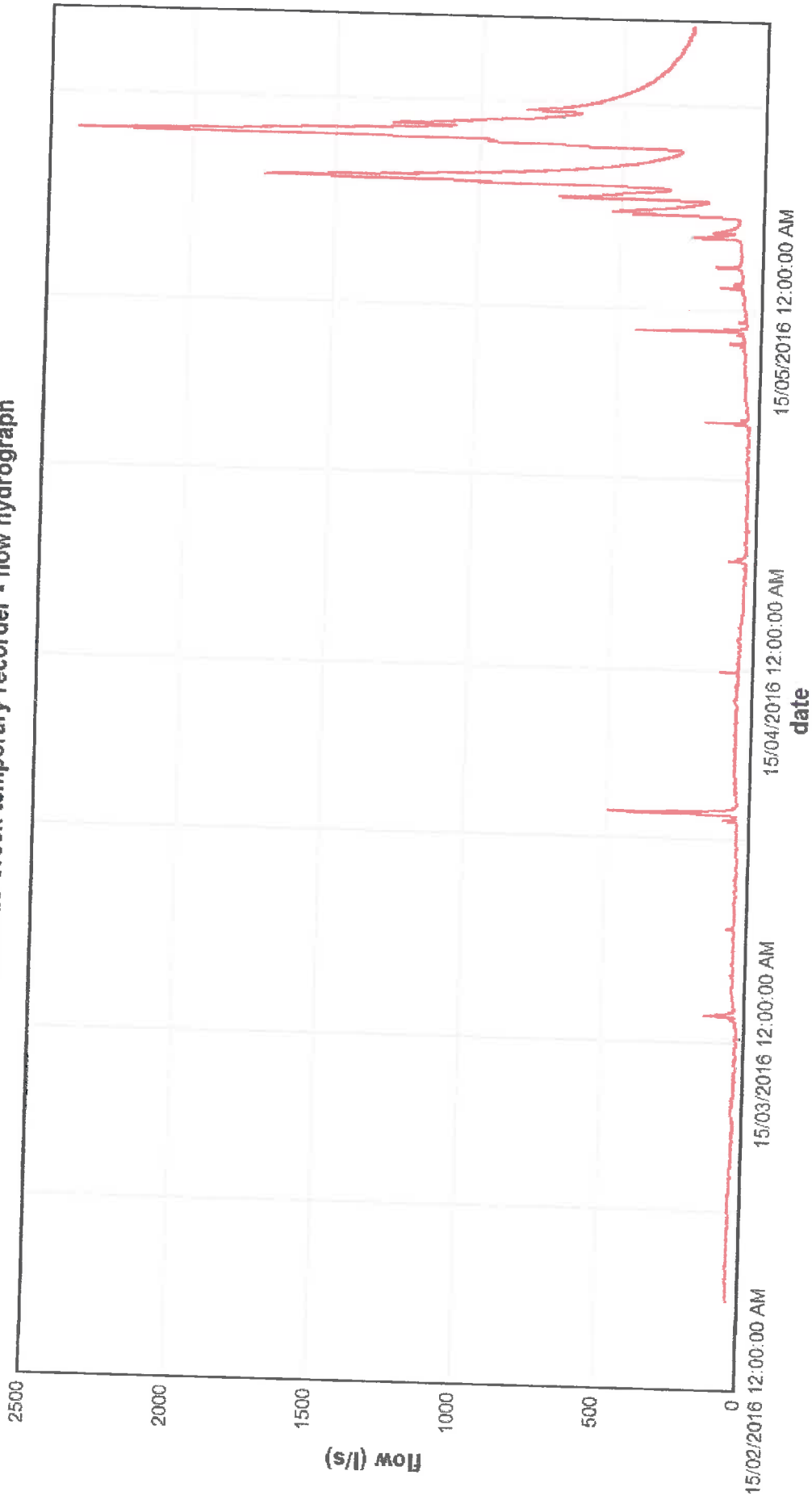


Figure 1 Donalds Creek temporary flow recorder - stage hydrograph June 2016

**Donalds Creek temporary recorder - flow hydrograph**



**Figure 2 Donalds Creek temporary flow recorder - flow hydrograph June 2016**

Donalds Creek temporary flow recorder - flow hydrograph (flows less than 500 l/s)

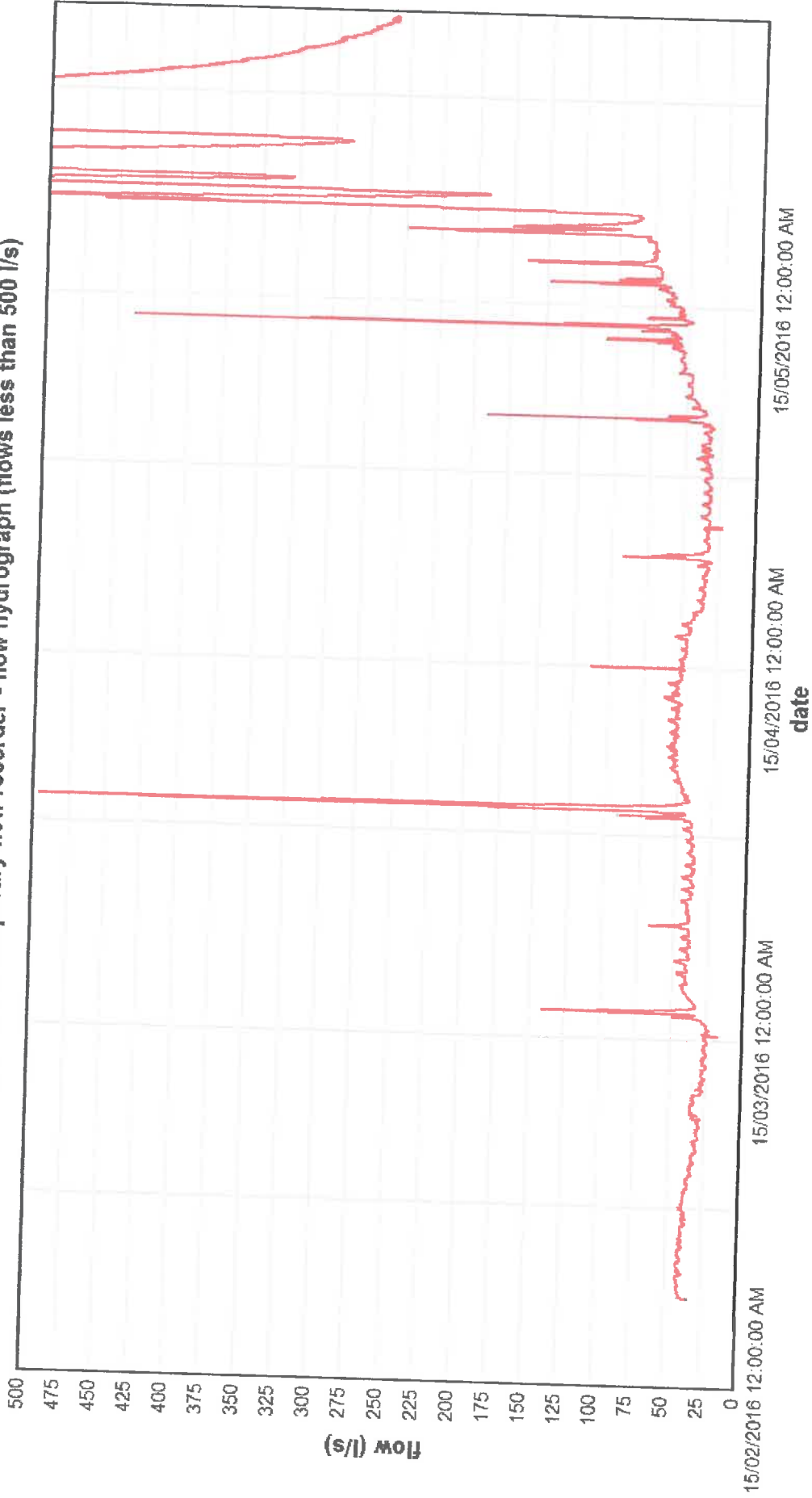


Figure 3 Donalds Creek temporary flow recorder - flow hydrograph (flows less than 500 l/s) June 2016

Donalds Creek temporary recorder - rating curve June 2016

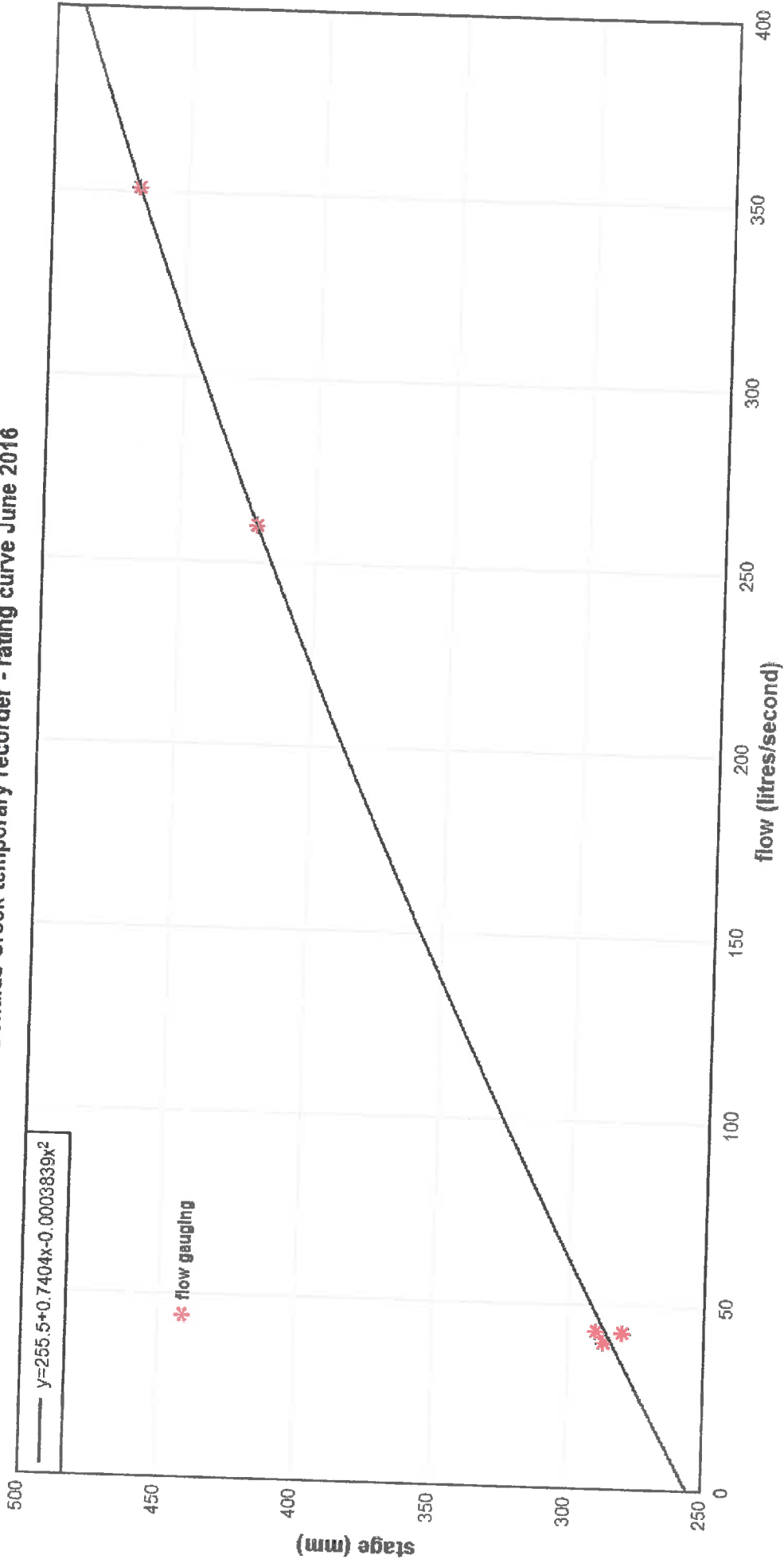


Figure 4 Donalds Creek temporary flow recorder - rating curve June 2016

## **Flow gaugings**

Donalds Creek at flow recorder 15/2/2016 start 0915 end 0945  
 Stage height 287mm

Distance from initial point (metres)	Observed depth (metres)	Method of observation	Depth of observation (metres)	Revolutions	Time (secs)	At point velocity (m/sec)	Mean velocity in vertical (m/sec)	Mean velocity in section (m/sec)	Mean depth (metres)	Width (metres)	Area (m <sup>2</sup> )	Discharge (m <sup>3</sup> /sec)
0.75	0	WERB 50%										
0.9	0.03							0.0487	0.015	0.15	0.0023	0.00011
1	0.05	0.6	0.03	12	41.9	0.0943	0.0943	0.0487	0.04	0.1	0.004	0.00019
1.15	0.05	0.6	0.03	13	42.6	0.0999	0.0999	0.0971	0.05	0.15	0.0075	0.00073
1.3	0.07	0.6	0.042	16	40.2	0.1276	0.1276	0.1138	0.06	0.15	0.009	0.00102
1.45	0.075	0.6	0.045	19	40.7	0.1481	0.1481	0.1379	0.0725	0.15	0.0109	0.0015
1.6	0.09	0.6	0.054	21	41.0	0.1616	0.1616	0.1549	0.0825	0.15	0.0124	0.00192
1.75	0.12	0.6	0.072	21	42.1	0.1576	0.1576	0.1596	0.105	0.15	0.0158	0.00251
1.9	0.145	0.6	0.087	26	40.3	0.2013	0.2013	0.1795	0.1325	0.15	0.0199	0.00357
2.05	0.16	0.6	0.096	30	41.0	0.2270	0.2270	0.2142	0.1525	0.15	0.0229	0.0049
2.2	0.17	0.6	0.102	25	40.4	0.1934	0.1934	0.2102	0.165	0.15	0.0248	0.0052
2.35	0.16	0.6	0.096	28	41.7	0.2091	0.2091	0.2013	0.165	0.15	0.0248	0.00498
2.5	0.145	0.6	0.087	24	41.3	0.1822	0.1822	0.1956	0.1525	0.15	0.0229	0.00448
2.65	0.15	0.6	0.09	19	41.3	0.1461	0.1461	0.1641	0.1475	0.15	0.0221	0.00363
2.8	0.14	0.6	0.084	19	41.6	0.1451	0.1451	0.1456	0.145	0.15	0.0218	0.00317
2.9	0.09	0.6	0.054	17	40.7	0.1335	0.1335	0.1393	0.115	0.1	0.0115	0.0016
3	0	WELB 50%						0.0668	0.045	0.1	0.0045	0.0003
Total flow (m <sup>3</sup> /sec)											0.03981	

Note: Staff gauge was in place, recorder established on 22/2/2016



Donalds Creek at flow recorder 22/2/2016 start 0900 end 0930  
 Stage height 280mm

Distance from initial point (metres)	Observed depth (metres)	Method of observation	Depth of observation (metres)	Revolutions	Time (secs)	At point velocity (m/sec)	Mean velocity in vertical (m/sec)	Mean velocity in section (m/sec)	Mean depth (metres)	Width (metres)	Area (m <sup>2</sup> )	Discharge (m <sup>3</sup> /sec)
0.75	0	WERB 50%										
0.9	0.03							0.0527	0.015	0.15	0.0023	0.00012
1.05	0.05	0.6	0.03	14	43.3	0.1054	0.1054	0.0527	0.04	0.15	0.006	0.00032
1.2	0.065	0.6	0.039	17	42.5	0.1282	0.1282	0.1168	0.0575	0.15	0.0086	0.00101
1.35	0.07	0.6	0.042	17	42.5	0.1282	0.1282	0.1282	0.0675	0.15	0.0101	0.0013
1.5	0.085	0.6	0.051	19	42.6	0.1419	0.1419	0.1351	0.0775	0.15	0.0116	0.00157
1.65	0.115	0.6	0.069	20	41.2	0.1537	0.1537	0.1478	0.1	0.15	0.015	0.00222
1.8	0.135	0.6	0.081	21	42.4	0.1566	0.1566	0.1551	0.125	0.15	0.0188	0.00291
1.95	0.15	0.6	0.09	31	41.0	0.2343	0.2343	0.1955	0.1425	0.15	0.0214	0.00418
2.1	0.17	0.6	0.102	29	40.6	0.2219	0.2219	0.2281	0.16	0.15	0.024	0.00547
2.25	0.18	0.6	0.108	25	40.3	0.1939	0.1939	0.2079	0.175	0.15	0.0263	0.00546
2.4	0.17	0.6	0.102	27	41.4	0.2033	0.2033	0.1986	0.175	0.15	0.0263	0.00521
2.55	0.165	0.6	0.099	22	42.6	0.1629	0.1629	0.1831	0.1675	0.15	0.0251	0.0046
2.7	0.15	0.6	0.09	20	40.8	0.1551	0.1551	0.1590	0.1575	0.15	0.0236	0.00376
2.85	0.15	0.6	0.09	18	41.4	0.1386	0.1386	0.1468	0.15	0.15	0.0225	0.0033
3	0.04							0.0693	0.095	0.15	0.0143	0.00099
3.05	0	WELB 50%						0.0693	0.02	0.05	0.001	6.9E-05
Total flow (m <sup>3</sup> /sec)												0.04247

Donalds Creek at flow recorder 6/4/2016 start 0845 end 0915  
 Stage height 290mm

Distance from initial point (metres)	Observed depth (metres)	Method of observation	Depth of observation (metres)	Revolutions	Time (secs)	At point velocity (m/sec)	Mean velocity in vertical (m/sec)	Mean velocity in section (m/sec)	Mean depth (metres)	Width (metres)	Area (m <sup>2</sup> )	Discharge (m <sup>3</sup> /sec)
0.6	0	WERB 70%										
								0.0167	0.01	0.15	0.0015	2.5E-05
0.75	0.02							0.0167	0.035	0.15	0.0053	8.8E-05
0.9	0.05	0.6	0.03	2	40.1	0.0239	0.0239	0.0485	0.06	0.15	0.009	0.00044
1.05	0.07	0.6	0.042	9	41.8	0.0732	0.0732	0.0746	0.0725	0.15	0.0109	0.00081
1.2	0.075	0.6	0.045	10	44.4	0.0761	0.0761	0.0792	0.0825	0.15	0.0124	0.00098
1.35	0.09	0.6	0.054	10	40.7	0.0822	0.0822	0.0851	0.095	0.15	0.0143	0.00121
1.5	0.1	0.6	0.06	11	41.5	0.0880	0.0880	0.1007	0.11	0.15	0.0165	0.00166
1.65	0.12	0.6	0.072	15	42.8	0.1134	0.1134	0.1258	0.135	0.15	0.0203	0.00255
1.8	0.15	0.6	0.09	18	41.5	0.1383	0.1383	0.1730	0.16	0.15	0.024	0.00415
1.95	0.17	0.6	0.102	27	40.5	0.2077	0.2077	0.2062	0.1775	0.15	0.0266	0.00549
2.1	0.185	0.6	0.111	27	41.1	0.2048	0.2048	0.2034	0.185	0.15	0.0278	0.00564
2.25	0.185	0.6	0.111	27	41.7	0.2019	0.2019	0.2034	0.185	0.15	0.0278	0.00564
2.4	0.185	0.6	0.111	27	41.1	0.2048	0.2048	0.1993	0.1775	0.15	0.0266	0.00531
2.55	0.17	0.6	0.102	25	40.3	0.1939	0.1939	0.1559	0.17	0.15	0.0255	0.00398
2.7	0.17	0.6	0.102	15	41.0	0.1180	0.1180	0.1111	0.165	0.15	0.0248	0.00275
2.85	0.16	0.6	0.096	13	40.7	0.1042	0.1042	0.0986	0.12	0.15	0.018	0.00177
3	0.08	0.6	0.048	12	42.6	0.0929	0.0929	0.0465	0.04	0.1	0.004	0.00019
3.1	0	WELB 50%										
											Total flow (m <sup>3</sup> /sec)	0.04268

Donalds Creek at flow recorder 27/5/2016 start 0950 end 1015  
 Stage height 468mm

Distance from initial point (metres)	Observed depth (metres)	Method of observation	Depth of observation (metres)	Revolutions	Time (secs)	At point velocity (m/sec)	Mean velocity in vertical (m/sec)	Mean velocity in section (m/sec)	Mean depth (metres)	Width (metres)	Area (m2)	Discharge (m3/sec)
0.5	0	WERB 30%										
								0.0422	0.04	0.15	0.006	0.00025
0.65	0.08							0.0422	0.11	0.15	0.0165	0.0007
0.8	0.14	0.6	0.084	18	40.7	0.1408	0.1408					
								0.2110	0.16	0.15	0.024	0.00506
0.95	0.18	0.6	0.108	37	40.5	0.2812	0.2812					
								0.2901	0.2	0.15	0.03	0.0087
1.1	0.22	0.6	0.132	40	41.1	0.2990	0.2990					
								0.3200	0.23	0.15	0.0345	0.01104
1.25	0.24	0.6	0.144	45	40.4	0.3409	0.3409					
								0.3695	0.25	0.15	0.0375	0.01386
1.4	0.26	0.6	0.156	53	40.6	0.3980	0.3980					
								0.4047	0.27	0.15	0.0405	0.01639
1.55	0.28	0.6	0.168	54	40.0	0.4113	0.4113					
								0.4001	0.295	0.15	0.0443	0.0177
1.7	0.31	0.6	0.186	52	40.8	0.3888	0.3888					
								0.3847	0.325	0.15	0.0488	0.01875
1.85	0.34	0.6	0.204	51	40.9	0.3806	0.3806					
								0.3824	0.35	0.15	0.0525	0.02008
2	0.36	0.6	0.216	51	40.5	0.3843	0.3843					
								0.4037	0.3675	0.15	0.0551	0.02225
2.15	0.375	0.6	0.225	56	40.3	0.4231	0.4231					
								0.4410	0.3825	0.15	0.0574	0.0253
2.3	0.39	0.6	0.234	61	40.4	0.4590	0.4590					
								0.4731	0.3975	0.15	0.0596	0.02821
2.45	0.405	0.6	0.243	65	40.5	0.4873	0.4873					
								0.4822	0.4075	0.15	0.0611	0.02948
2.6	0.41	0.6	0.246	63	40.1	0.4772	0.4772					
								0.4692	0.42	0.15	0.063	0.02956
2.75	0.43	0.6	0.258	61	40.2	0.4612	0.4612					
								0.4343	0.43	0.15	0.0645	0.02801
2.9	0.43	0.6	0.258	54	40.4	0.4073	0.4073					
								0.3749	0.425	0.15	0.0638	0.0239
3.05	0.42	0.6	0.252	45	40.2	0.3426	0.3426					
								0.3149	0.4125	0.15	0.0619	0.01948
3.2	0.405	0.6	0.243	38	40.7	0.2872	0.2872					
								0.2619	0.3925	0.15	0.0589	0.01542
3.35	0.38	0.6	0.228	31	40.6	0.2365	0.2365					
								0.2025	0.375	0.15	0.0563	0.01139
3.5	0.37	0.6	0.222	22	41.1	0.1685	0.1685					
								0.1111	0.295	0.15	0.0443	0.00492
3.65	0.22	0.6	0.132	6	40.0	0.0537	0.0537					
								0.0269	0.11	0.15	0.0165	0.00044
3.8	0	WELB 50%										
								Total flow (m3/sec)				0.3509

Donalds Creek at flow recorder 7/6/2016 start 1045 end 1115  
 Stage height 422mm

Distance from initial point (metres)	Observed depth (metres)	Method of observation	Depth of observation (metres)	Revolutions	Time (secs)	At point velocity (m/sec)	Mean velocity in vertical (m/sec)	Mean velocity in section (m/sec)	Mean depth (metres)	Width (metres)	Area (m2)	Discharge (m3/sec)
0.5	0	WERB 30%										
								0.0272	0.02	0.15	0.003	8.2E-05
0.65	0.04							0.0272	0.0575	0.15	0.0086	0.00023
0.8	0.075							0.0272	0.0895	0.15	0.0134	0.00036
0.95	0.104	0.6	0.0624	12	43.8	0.0906	0.0906	0.1506	0.117	0.15	0.0176	0.00264
1.1	0.13	0.6	0.078	28	41.4	0.2105	0.2105	0.2352	0.14	0.15	0.021	0.00494
1.25	0.15	0.6	0.09	34	40.4	0.2598	0.2598	0.2759	0.1625	0.15	0.0244	0.00673
1.4	0.175	0.6	0.105	38	40.0	0.2921	0.2921	0.3052	0.185	0.15	0.0278	0.00847
1.55	0.195	0.6	0.117	44	42.4	0.3182	0.3182	0.3271	0.2025	0.15	0.0304	0.00994
1.7	0.21	0.6	0.126	44	40.1	0.3360	0.3360	0.3413	0.225	0.15	0.0338	0.01152
1.85	0.24	0.6	0.144	46	40.6	0.3466	0.3466	0.3733	0.245	0.15	0.0368	0.01372
2	0.25	0.6	0.15	53	40.4	0.3999	0.3999	0.3953	0.25	0.15	0.0375	0.01482
2.15	0.25	0.6	0.15	52	40.6	0.3907	0.3907	0.3893	0.265	0.15	0.0398	0.01548
2.3	0.28	0.6	0.168	51	40.1	0.3880	0.3880	0.4035	0.285	0.15	0.0428	0.01725
2.45	0.29	0.6	0.174	56	40.7	0.4190	0.4190	0.4269	0.2975	0.15	0.0446	0.01905
2.6	0.305	0.6	0.183	58	40.6	0.4347	0.4347	0.4426	0.3125	0.15	0.0469	0.02075
2.75	0.32	0.6	0.192	60	40.5	0.4505	0.4505	0.4415	0.325	0.15	0.0488	0.02152
2.9	0.33	0.6	0.198	57	40.1	0.4326	0.4326	0.4135	0.34	0.15	0.051	0.02109
3.05	0.35	0.6	0.21	52	40.2	0.3945	0.3945	0.3912	0.35	0.15	0.0525	0.02054
3.2	0.35	0.6	0.21	51	40.1	0.3880	0.3880	0.3501	0.36	0.15	0.054	0.0189
3.35	0.37	0.6	0.222	41	40.3	0.3122	0.3122	0.2738	0.37	0.15	0.0555	0.0152
3.5	0.37	0.6	0.222	31	40.8	0.2354	0.2354	0.2082	0.33	0.15	0.0495	0.0103
3.65	0.29	0.6	0.174	24	41.6	0.1809	0.1809	0.1278	0.265	0.15	0.0398	0.00508
3.8	0.24	0.6	0.144	9	40.8	0.0747	0.0747	0.0374	0.16	0.15	0.024	0.0009
3.95	0.08							0.0374	0.04	0.15	0.006	0.00022
4.1	0	WELB 50%						Total flow (m3/sec)			0.25974	