

Armidale Sewage Treatment Plant (STP)

Location: 631 Cafferries Road, Armidale NSW 2350 Environment Protection Licence Number: 1722 Activities: Sewage treatment
 Licensee under Protection of Environment Operations Act 1997 (POEO Act): Armidale Dumaresq Council, PO Box 75A, Armidale NSW 2350

The internet link to Licence No. 1722 is <http://www.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=30769&SYSUID=1&LICID=1722>

Council is required to monitor the volume and quality of outgoing treated wastewater (also called effluent). Up to 50% of the treated wastewater is used for irrigation on Council's surrounding cropping and grazing properties. Soils, biosolids, and groundwater are also tested to assist environmental management. This document details recent results. To meet its obligation under Section 66 (6) of the POEO Act, a link to the current version of this document is available on Council's website.

The locations of sampling points are shown on the adjacent figure. Some historical names are used. P stands for piezometer; WW = Windways Well. Corresponding Environment Protection Authority (EPA) Identification Numbers detailed on the Licence are provided below.

EPA Point No. 1 (quality monitoring - discharge to Commissioners Waters)

EPA Point No. 2 (soils and mass monitoring on 'Mt Kennedy' & areas A & B irrigation fields)

EPA Point No. 3 (volume monitoring for 'Mt Kennedy' & areas A, B & C)

EPA Point No. 4 (soils & mass monitoring 'Windways' irrigation field)

EPA Point No. 5 (volume monitoring of discharge to 'Windways')

EPA Point No. 6 (quality monitoring of electric pump discharge to 'Mt Kennedy' & areas A, B & C)

EPA Point No. 7 (quality monitoring of diesel pump discharge to 'Windways' irrigation areas)

EPA Point No. 8 (volume monitoring sludge lagoons)

EPA Point No. 9 (Biosolids monitoring)

EPA Point No. 10 (P6 groundwater monitoring)

EPA Point No. 11 (P7 groundwater monitoring)

EPA Point No. 12 (P17 groundwater monitoring)

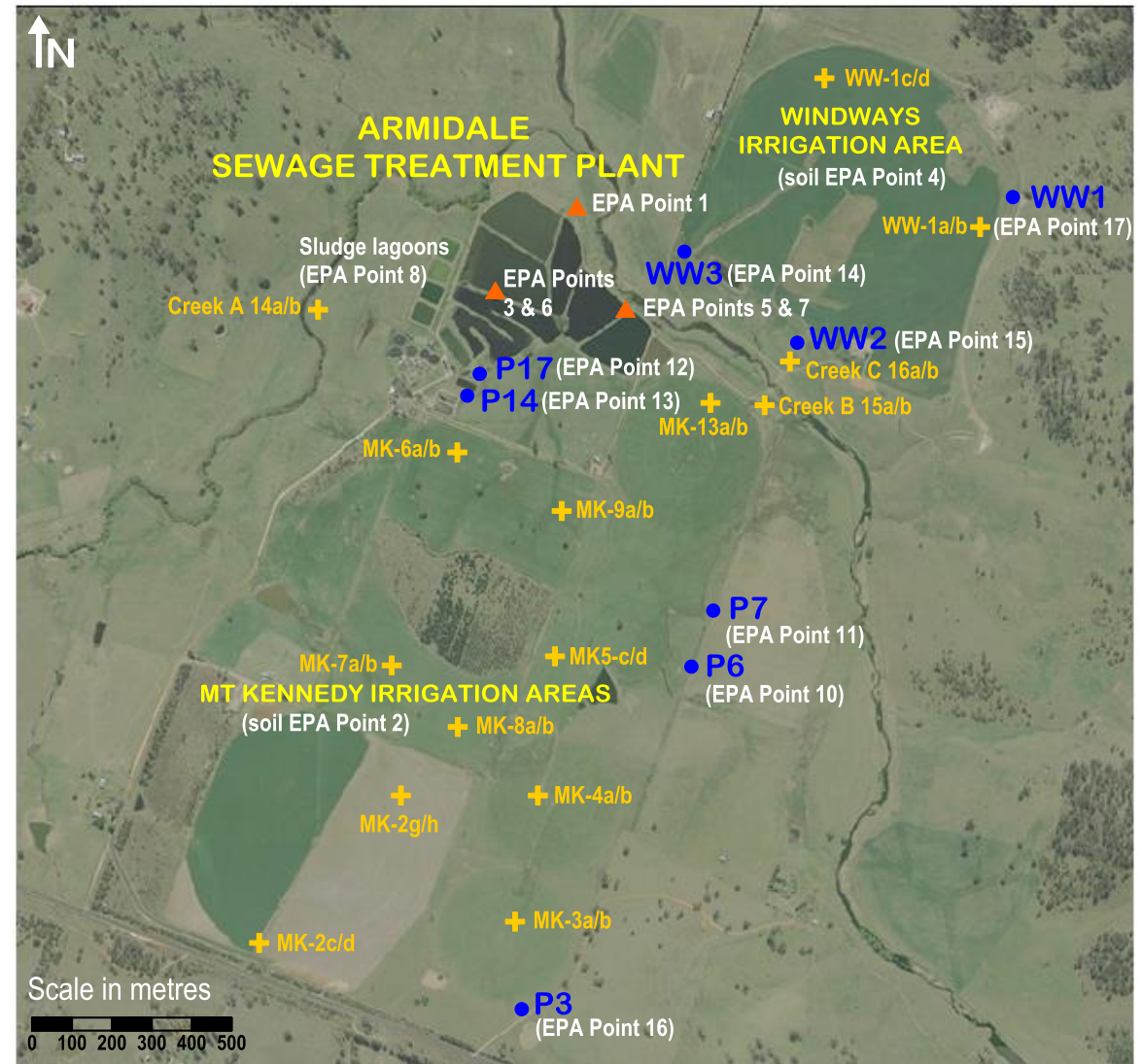
EPA Point No. 13 (P14 groundwater monitoring)

EPA Point No. 14 (WW3 groundwater monitoring)

EPA Point No. 15 (WW2 groundwater monitoring)

EPA Point No. 16 (P3 groundwater monitoring)

EPA Point No. 17 (WW1 groundwater monitoring)



Base map: Department of Lands 2010. Deep yellow sampling points are for soil.

Monitoring results for the last four years are presented on following pages – as required in the EPA publishing requirements.

The following tables provide results required by licence. Some additional results are also provided. Results are organised in their field and laboratory presentation order.

Abbreviations in the tables are provided here in alphabetical order:

BOD₅ = Biochemical Oxygen Demand over five days; Ca = Calcium; Cl = Chloride; EC = Electrical Conductivity also called conductivity; ESP = Exchangeable Sodium Percentage; Ex = Exchangeable; FC = Faecal Coliforms; K = Potassium; Na = Sodium; Mg = Magnesium; NH₃ = Ammonia as a measure of ammonium ions; NO₃ = Nitrate; NO_x = Nitrite + Nitrate = Nitrogen Oxides; NC = Not continuing; NR = Not required; OM = Organic Matter; O&G = Oil and Grease; PSC = Phosphorus Sorption Capacity; S = Sulphur; SAR = Sodium Absorption Ratio; SRP = Soluble Reactive Phosphorus (also RP); TSS = Total suspended solids; TKN = Total Kjeldahl Nitrogen (organic nitrogen + ammonia); TN = Total Nitrogen; TP = Total Phosphorus.

Measures:

CFU/100mL = Colony Forming Units/100mL; dS/cm = deciSiemens per centimetre; mg/kg = milligram/kilogram; mg/L = milligram per litre (equivalent to ppm); µS/cm = microSiemens per cm; < = less than, kL = kilolitres.

Limits:

90 percentile concentration - the monitoring results should not exceed the specified limit for 90% of the time, so for monthly tests, only 1 of the 12 results in the year should exceed the 90% concentration. These concentration limits apply to BOD, O&G, and TSS. For TN and TP, Council pays a fee based on the load (mass in the volume) discharged to Commissioners Waters.

Choice of water quality analytes:

Some analytes are tested because they give a general understanding of the discharge quality of treated effluent. For example, it is best that effluent used for irrigation or discharge to streams is not too salty. EC is an indicator of salt levels. It is best that EC be at least <1000 µS/cm. The pH range recommended for discharged effluent is pH 6.5 to 8.5, which is not too acidic or too alkaline to harm the bacteria breaking down the effluent, or the stream biota. Reasons for some other analytes are as follows:

- The BOD₅ test has traditionally been used by wastewater professionals to manage wastewater treatment processes. It is measured by the quantity of oxygen consumed by microorganisms during a five-day period, as a measure of the amount of biodegradable organic material in, or strength of, sewage. Sewage high in BOD can deplete oxygen in receiving waters, causing fish kills and ecosystem changes. A common standard is to treat sewage so that the BOD₅ of treated effluent is less than 20 mg/L (i.e. 20 mg of O₂ are consumed per litre of water over 5 days to break down the waste).
- The volume of sludge produced in a treatment plant is directly related to the TSS present in the sewage. The extent to which a treatment plant removes suspended solids (SS), as well as BOD₅, determines the efficiency of the treatment process. Suspended solids can smother stream biota. A common standard is to treat sewage so that the TSS of the treated effluent is less than 30 mg/L.
- Chloride and sodium are major elements of salt that can cause foliar injury during irrigation.
- SAR (Sodium Absorption Ratio) indicates if soil may be affected by sodicity, that is, the presence of a high proportion of sodium (Na⁺) ions relative to calcium (Ca²⁺) and magnesium (Mg²⁺) ions in soil or water. Sodicity degrades soil structure by breaking down clay aggregates. This makes the soil more erodible, less permeable to water, and reduces plant growth. In general, the higher the sodium adsorption ratio, the less suitable the water is for irrigation. Plants have ranges of SAR tolerance. Examples: citrus trees can tolerate SAR 2 to 8; oats SAR 18 to 46; and wheat, cotton and barley SAR 4 to 102.
- Increased levels of faecal coliforms (FC) warn of problems with the effluent treatment and possible contamination with pathogens. Raw sewage FC counts are in the millions. Note the low counts of the treated effluent in Table 1.
- Ammonia as ammonium ions can cause fish kills and affect other stream biota. While travelling through sewer pipes, the majority of the nitrogen contained in raw sewage is converted from organic-nitrogen to ammonium compounds.
- At the sewage treatment works, bacteria remove nitrogen compounds from the effluent by a two-step biological process. The first step is nitrification in which ammonium is converted to nitrate nitrogen in aerobic conditions (with air). (NO_x is usually predominantly nitrate.) The second step is denitrification in which nitrate is reduced to nitrogen gas (N₂) in anaerobic conditions (without air). So testing for the various nitrogen compounds alerts to any problems in the sewage treatment process.
- Total Phosphorus (TP) is a component of animal and plant matter in sewage. SRP represents the fraction of TP that is available to organisms for growth. If discharged into streams in high quantities it may stimulate growth of photosynthetic organisms such as algae. The discharged phosphorus is diluted many times in Commissioners Waters.

Table 1a: Treated wastewater discharge quality – EPA Point No.1 – discharge to Commissioners Waters

	Frequency required by licence	Received from laboratory	Accessible on Council website by	BOD	TSS	O&G	pH	NH ₃	NO _x	TKN	TN	SRP	TP	EC	FC	Na	Ca	K	Mg	SAR	Cl
Measure				mg/L	mg/L	mg/L		mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	µS/cm	CFU/ mL	mg/L	mg/L	mg/L	mg/L		mg/L
90 percentile concentration				20	30	10															
EPA Point No. 1 – discharge to Commissioners Waters	Monthly															NR	NR	NR	NR	NR	NR
29/01/15		11/02/15	17/02/15	2.4	3	<5	7.96	1.88	2.10	4.4	6.5	8.11	8.67	700	124	83.2	38.2	24.2	19.7	2.7	60
26/02/15		04/03/15	04/03/15	<1.0	13	<5	9.44	0.02	2.08	1.3	3.4	2.03	2.04	647	30	85.8	28.0	22.4	26.2	2.8	63
31/03/15		06/04/15	13/04/15	9.2	56	<5	8.07	3.17	.476	5.1	5.6	8.12	8.56	797	104	93.8	37.2	26.2	26.0	2.9	74
30/04/15		06/05/15	7/05/15	3.2	5	<5	7.8	5.33	8.88	4.5	13.4	8.08	8.48	805	44	88.6	37.1	25.0	24.0	2.8	65
28/05/15		02/06/15	05/06/15	3.7	5	<5	7.66	10.3	10.6	11.2	21.8	6.80	6.82	815	36	83.7	35.4	23.9	22.3	2.7	63
30/06/15		06/07/15	07/07/15	2.1	8	<5	7.67	8.93	10.7	9.8	20.5	5.25	5.42	545	35	79.4	36.4	21.8	22.4	2.6	54
30/07/15		28/08/15	10/09/15	5	13	<5	7.87	6.64	17.2	6.8	24.0	6.25	7.01	827	35	78.0	34.0	20.4	22.4	2.6	61
31/08/15		09/09/15	10/09/15	3.9	10	<5	7.74	11.6	8.65	15.4	24.0	5.26	6.75	7364	20	71.1	32.7	17.6	21.4	2.4	51
30/09/15		06/10/15	9/11/15	6.8	23	<5	8.32	5.27	9.32	8.1	17.4	6.08	6.18	730	10	80.1	35.0	21.4	22.5	2.6	60
30/10/15		06/11/15	9/11/15	30	8	<5	8.04	1.34	8.95	7.8	16.8	6.45	7.69	740	20	85.9	33.5	21.5	20.9	2.9	70
26/11/15		02/12/15	07/11/15	1.5	13	<5	8.88	1.3	2.93	1.5	4.4	4.15	4.59	656	40	81.8	23.6	20.1	18.1	3.1	59
29/12/15		03/01/16	07/01/16	3.9	18	<5	7.95	5.59	1.07	7.7	9.2	8.17	8.68	725	170	82.5	33.6	23.3	20.5	2.8	63
28/01/16		6/02/16	12/02/16	2.4	8	<5	8.31	1.52	2.39	3.4	5.80	6.16	6.41	639	300	63.7	29.5	18	18	2.3	55
29/02/16		06/02/16	08/03/16	1.3	3	<5	9.41	.15	.552	4.6	5.2	2.34	2.43	600	30	72.2	25.3	19.9	19	2.6	55
31/03/16		11/04/16	14/04/16	4.5	23	<5	7.82	5.15	.78	6.7	7.5	7.80	7.82	739	440	78.7	30	23.8	21.3	2.7	60
29/04/16		04/05/16	14/05/16	.7	10	<5	8.58	5.7	4.84	.9	5.7	5.85	5.91	685	105	72.5	32.9	22	21.2	2.4	61
31/05/16		9/06/16	14/06/16	1	3	<5	8.46	3.84	.672	16.6	17.3	6.53	6.59	748	50	74.1	27.8	23.3	19.9	2.6	62
29/06/16		06/07/16	06/07/16	5	3	<5	7.70	8.18	10.5	10.7	21.2	4.53	4.83	702	100	65.5	31.3	19.9	18.9	2.3	53
29/07/16		10/08/16	11/08/16	3.9	5	<5	7.97	6.65	10.6	9.6	20.2	4.65	5.20	697	10	66.2	33.6	19.6	21.4	2.2	55
31/08/16		09/09/16	14/09/16	6.1	5	<5	8.23	2.65	7.57	6.5	14.1	1.16	1.34	519	30	44.2	30.6	11.5	17.3	1.6	44
30/09/16		11/10/16	12/10/16	8.9	5	<5	7.43	7.61	4.165	12.0	16.2	3.50	3.66	649	20	56.3	30.5	14.5	16.9	2.0	50
31/10/16		13/11/16	14/11/16	10.8	8	<5	7.56	10.6	1.33	14.3	15.6	3.65	3.75	661	610	58.8	27.7	15.6	16.6	2.2	46
30/11/16		09/12/16	14/11/16	8.1	5	<5	8.51	3.56	.203	5.2	5.40	4.84	5.24	6.25	15	70.1	27.5	17.1	16.5	2.6	52
28/12/16		05/01/16	10/01/16	1.1	10	<5	9.28	0.25	3.01	2.6	5.6	3.44	3.50	584	96	69.1	22.6	14.2	16.5	2.7	54
31/01/17		12/02/17	16/02/17	69	20	<5	8.78	.63	0.075	5.5	5.60	4.88	601	631	200	72.9	23.4	20.8	17	2.8	59
28/02/17		15/02/17	15/02/17	40	8.9	<5	8.77	0.47	1.28	6.1	7.4	3.72	5.64	619	110	72.2	26.2	18.0	18.2	2.7	58
30/03/17		7/04/17	05/05/17	6.8	8	<5	7.80	1.73	4.66	5.8	10.5	3.93	3.96	476	60	53.2	27.8	13.8	14.4	2	36
28/04/17		7/04/17	05/05/17	5	10	<5	7.81	6.64	4.21	6.5	10.7	4.15	4.20	652	10	69.8	33.0	17.3	18.0	2.4	54
31/05/17		6/06/17	6/06/17	3	2.6	<5	7.80	16.4	7.22	9.2	16.4	4.49	4.59	771	25	71.3	28.5	18.1	16.2	2.6	55
29/06/17		04/07/17	12/07/17	3.8	5	<5	7.66	10.0	8.02	11.6	19.6	4.16	4.40	691	5	57.1	27.5	15.7	15.7	2.2	50
31/07/17		14/08/17	16/08/17	2.7	3	<5	7.80	11.2	10.5	7.9	18.4	4.14	4.57	739	<1	64.2	31.7	15.9	17.6	2.3	54
31/08/17		07/09/17	11/09/17	3.2	8	<5	7.89	11.4	6.95	16.2	23.1	4.89	5.24	802	70	74.7	33.1	17.9	23.7	2.4	59
28/09/17		05/10/17	11/10/17	2.9	13	<5	7.88	8.70	2.36	11.0	13.4	5.29	5.40	826	150	80	32.9	19	19.3	2.1	65
31/10/17		08/11/17	09/11/17	5.6	10	<5	7.92	6.3	5.58	8.8	14.4	4.28	4.70	660	75	60.3	27.2	14.2	16.1	2.3	48
30/11/17		7/11/17	11/12/17	5.5	10	<5	8.58	.55	2.07	12.3	14.4	4.88	5.12	676	210	74	28.1	17.1	18.3	2.7	58
28/12/17		03/12/17	08/01/18	1.5	12	<5	9.35	.77	.795	.8	1.60	3.80	3.58	648	40	87.6	25.3	15.1	19.9	3.2	65

Table 1a continued: Treated wastewater discharge quality – EPA Point No.1 – discharge to Commissioners Waters

	Frequency required by licence	Received from laboratory	Accessible on Council website by	BOD	TSS	O&G	pH	NH ₃	NO _x	TKN	TN	SRP	TP	EC	FC	Na	Ca	K	Mg	SAR	Cl
Measure				mg/L	mg/L	mg/L		mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	µS/cm	CFU/ mL	mg/L	mg/L	mg/L	mg/L		mg/L
90 percentile concentration				20	30	10															
EPA Point No. 1 – discharge to Commissioners Waters	Monthly															NR	NR	NR	NR	NR	NR
31/01/18	07/02/18	08/02/18	2.8	5	<5	9.67	<0.2	0.116	1.4	1.5	1.22	1.41	600	5	96.0	19.4	14.2	4.9	5.1	75	
28/02/18	7/03/18	14/03/18	4.5	13	<5	8.08	3.36	0.215	5.1	5.3	7.99	8.78	752	90	94.1	30.7	21.3	19.8	3.3	71	
28/03/18	04/04/18	23/04/18	8.3	13	<5	7.93	5.47	0.479	6.9	7.4	10.3	10.2	772	190	84.7	37.7	21.6	23.2	2.7	72	
27/04/18	08/05/18	8/05/18	5.5	23	<5	8.07	1.97	0.836	3.5	4.30	8.52	8.75	784	45	87.3	36.7	21.2	24.2	2.7	69	
31/05/18	06/06/18	08/06/18	4.5	5	<5	7.80	11.4	8.83	8.3	17.1	4.98	5.42	758	20	81.6	33.9	21.0	23.2	2.6	66	
28/06/18	05/07/18	09/07/18	9.3	13	<5	8.40	8.92	7.52	10.4	17.9	4.78	4.80	766	35	79.6	32.5	22.6	23.9	2.6	62	
31/07/18	17/08/18	27/08/18	15.7	27	<5	8.30	10.6	2.01	18.3	20.3	3.75	4.03	778	65	75.3	29.6	18.6	21	2.6	57	
31/08/18	07/09/18	12/09/18	5.0	10	<5	7.74	14.8	4.85	16.3	21.1	4.67	4.97	804	5	72.7	32.2	21.1	23.9	2.4	65	
29/09/18	3/10/18	12/10/18	6.3	15	<5	7.94	12.2	4.46	14.9	19.4	6.43	8.88	767	15	69.6	34.6	21.0	21.8	2.3	57	
30/10/18	7/11/18	13/11/18	6.9	18	<5	7.78	10.1	4.05	12.1	16.1	4.45	4.65	694	65	66.8	31.5	17.5	22.2	2.2	48	
30/11/18	8/12/18	14/12/18	6.0	15	<5	7.94	2.75	1.16	4.3	5.5	4.29	4.57	691	110	79.9	36.4	19.7	28.2	2.4	58	
31/12/18	7/01/19	8/01/19	2.1	58	<5	9.66	0.10	0.25	4.2	4.4	1.04	1.32	593	190	76.1	25.1	16.2	21.6	2.7	56	
29/01/19	4/02/19	22/02/19	4.7	8	<5	8.96	0.45	0.38	6.6	7.0	3.02	3.27	637	50	80.4	23.5	20.6	17.6	3.1	71	
28/02/19	6/03/19	14/03/19	6.5	80	<5	8.28	2.4	1.23	5.6	3.8	7.22	7.42	846	230	97.7	35.5	24.6	26.2	3.0	89	
29/03/19	4/04/19	05/04/19	6.8	37	<5	8.05	2.57	.87	4.1	5.0	6.03	6.80	913	1150	98.4	40.5	26.8	30.4	2.8	94	
26/04/19	2/05/19	10/05/19	7.1	8	<5	8.04	3.94	1.54	3.6	5.1	6.98	7.02	914	120	88.4	44.1	25.8	30.4	2.5	85	
31/05/19	10/05/19	12/06/19	5.2	8	<5	8.11	4.14	5.85	4.0	9.9	5.20	5.72	873	40	96.3	43.8	27.1	31.4	2.7	85	
26/06/19	12/06/19	25/06/19	2.3	8	<5	7.69	3.21	2.30	17.4	19.7	4.25	4.78	480	54	90.9	38.9	25.5	28.3	2.7	76	
31/07/19	7/08/19	8/08/19	4.5	15	<5	7.91	12.2	3.56	18.9	22.2	5.20	5.58	917	20	92.9	40.2	26.0	28.5	2.7	79	
29/08/19	3/09/19	5/09/19	12.2	15	<5	8.11	13.6	5.85	15.9	21.8	5.28	5.92	898	80	94	40.9	27.3	29.6	2.7	80	
27/09/19	08/11/19	8/11/19	9.9	43	<5	8.40	10.7	3.14	4.9	4.9	8.0	4.88	5.55	864	104.5	43.3	28.4	33.6	2.9	83	
31/10/19	6/10/19	8/11/19	30.6	220	<5	9.14	0.21	0.05	6.45	6.5	2.73	3.54	945	730	131.5	44.4	32.4	36.0	3.6	119	

Table 1b: Treated wastewater discharge quality – EPA Point No.6 – electric pump irrigation to Mt Kennedy

Measure	Frequency required by licence	Received from laboratory	Accessible on Council website by	BOD	TSS	O&G	pH	NH ₃	NO _x	TKN	TN	SRP	TP	EC	FC	Na	Ca	K	Mg	SAR	Cl
				mg/L	mg/L	mg/L		mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	µS/cm	CFU/mL	mg/L	mg/L	mg/L	mg/L		mg/L
90 percentile concentration				20	30	10															
EPA Point No. 6 – electric pump irrigation to Mt Kennedy	Monthly (M) /Quarterly (Q)			M	M	M	M	NR	NR	NR	M	NR	M	M	M	Q	Q	Q	Q	Q	Q
29/01/15		11/02/15	17/02/15	8.9	38	<5	7.60	3.66	3.98	3.9	7.9	7.07	7.25	708	640	84.5	36.0	24.0	19.2	2.8	60
26/02/15		04/03/15	04/03/05	4.1	45	<5	8.50	0.18	4.71	1.0	5.7	5.25	5.33	709	80	89.5	33.9	23.6	28.3	2.7	68
31/03/15		06/04/15	13/04/15	11.1	23	<5	8.49	1.43	7.42	4	11.4	6.50	6.91	967	460	92.9	33.7	24.4	24.3	3	73
30/04/15		6/05/15	7/05/15	6.5	43	<5	7.83	8.38	11.5	9	20.5	6.44	6.78	7.87	304	89.1	35.4	24.3	23	2.9	65
28/05/15		2/06/15	05/06/15	4.3	3	<5	7.55	11.2	12.5	11.5	24	6.54	6.64	792	160	79.9	33.5	23.1	21.2	2.7	62
30/06/15		06/07/15	07/07/15	3.6	5	<5	7.54	8.66	16.4	8.1	24.5	5.46	5.65	563	290	80.7	36.3	21.9	22.3	2.6	70
30/07/15		28/08/15	10/09/15	5	13	<5	7.87	6.64	17.2	6.8	24	6.25	7.01	827	35	74.6	33	19.9	21.8	2.5	59
31/08/15		09/09/15	10/09/15	5.4	28	<5	7.82	9.79	7.68	14.7	22.4	4.34	5.65	685	290	65	32.8	15.5	20	2.2	46
30/09/15		6/10/15	9/11/15	2.9	10	<5	8.05	6.75	12.5	11	23.5	6.24	6.43	768	25	83.6	34.2	21.6	22.1	2.7	63
30/10/15		6/11/15	9/11/15	11.7	38	<5	7.73	9.54	9.96	11.5	21.5	6.72	7.55	790	100	84.3	31.7	22	19.4	2.9	66
26/11/15		02/12/15	07/11/15	10.3	15	<5	8.10	2.08	3.19	4.0	7.20	7.22	7.69	682	280	79.4	30.1	20.9	18.4	2.8	56
29/12/15		3/01/16	07/01/16	3	10	<5	8.43	4.09	3.08	6.6	9.7	6.02	7.19	670	240	75.2	29.6	20.7	18.1	2.7	58
28/01/16		6/02/16	12/02/16	3.9	8	<5	7.86	2.64	2.96	4.8	7.80	6.39	6.39	653	180	65.9	30.4	18.5	18.3	2.3	54
29/02/16		06/02/16	08/03/16	2.7	30	<5	9.03	43	2.25	6.2	8.4	4.30	4.47	662	700	78.4	29.5	19.9	20.1	2.7	60
31/03/16		11/04/16	14/04/16	4	15	<5	7.93	6.33	3.89	9.9	13.8	7.57	7.70	728	1550	76.7	31.7	24.4	21.5	2.6	61
29/04/16		04/05/16	14/05/16	4	10	<5	7.67	17.5	12.1	5.4	17.5	5.62	5.85	663	55	67.6	30.2	18.9	19.8	2.3	59
31/05/16		9/06/16	14/06/16	6.3	8	<5	7.88	12.7	10.5	19.5	29.7	6.25	6.26	833	900	71.5	29.2	22.2	19.6	2.5	58
29/06/16		06/07/16	06/07/16	6.1	3	<5	7.68	9.39	9.55	13.1	22.6	4.30	4.61	688	440	62.1	30.3	18.4	17.9	2.2	51
29/07/16		10/08/16	11/08/16	3.9	8	<5	7.95	10.4	10	14.3	24.3	3.88	3.93	702	135	62.6	32.4	18.1	20.4	2.1	53
31/08/16		09/09/16	14/09/16	4.8	10	<5	7.52	4.65	6.57	8.6	15.2	1.54	1.65	566	35	48.3	32.7	11.3	19	1.7	48
30/09/16		11/10/16	12/10/16	15.5	5	<5	7.70	10.8	6.826	12.3	19.4	3.72	3.97	700	24	60.6	30.3	14.7	17.2	2.2	52
31/10/16		13/11/16	14/11/16	9	3	<5	7.80	9.26	3.88	12.9	16.8	3.36	3.43	635	70	58.8	27.7	14.3	16.4	2.2	43
30/11/16		09/12/16	14/11/16	19.1	33	<5	7.64	5.85	8.42	9.8	10.6	4.60	5.52	665	5	73.1	26.8	18	16.6	2.7	53
28/12/16		05/01/16	10/01/16	12.5	73	<5	8.34	2.38	5.57	3.6	9.2	3.76	4.01	594	80	61.9	24.2	17.5	15.8	2.4	50
31/01/17		12/02/17	16/02/17	10.5	44	<5	8.95	1.22	2.130	7.7	9.20	4.23	5.44	626	150	62.3	25.2	18.2	14.8	2.4	56
28/02/17		15/02/17	15/02/17	9.0	24	<5	9.10	0.28	0.55	9.0	9.6	3.33	4.36	626	235	77.2	25.1	18.9	18.6	2.8	52
30/03/17		7/04/17	05/05/17	7.7	3	<5	7.63	3.30	4.72	7.5	12.2	3.84	3.85	503	290	54.1	28.7	13.4	14.8	2	37
28/04/17		7/04/17	05/05/17	6.3	15	<5	7.82	6.93	7.54	3.8	11.3	4.75	4.84	694	185	73.1	31.8	18.3	18	2.6	56
31/05/17		6/06/17	6/06/17	3	3.3	<5	7.66	20.0	9.13	10.9	20.0	4.69	4.83	729	340	70.1	27.6	17.5	15.8	2.6	55
29/06/17		04/07/17	12/07/17	4.8	8	<5	7.58	11.6	9.92	13.6	23.4	4.67	4.77	915	190	61.0	28.4	16.2	16.2	2.3	52
31/07/17		14/08/17	16/08/17	7.2	5	<5	7.77	12.3	9.40	10.9	20.3	4.35	4.80	758	65	68.3	31.1	16.2	17.6	2.4	54
31/08/17		07/09/17	11/09/17	3.6	5	<5	7.81	4.34	5.17	7.4	12.6	4.02	6.22	724	100	71.4	32.5	16.6	23.5	2.3	60
28/09/17		05/10/17	11/10/17	20.4	95	<5	8.61	11.8	3.33	19.2	22.5	6.09	6.79	811	525	78.1	29.4	18.8	17.8	2.8	65
31/10/17		08/11/17	09/11/17	6.9	10	<5	7.82	6.68	6.02	7.4	13.4	4.21	4.65	675	230	63.1	28.4	14.6	16.4	2.3	50
30/11/17		7/11/17	11/12/17	9.6	8	<5	7.72	2.87	3.62	4.4	8.0	5.81	5.83	695	40	75.1	27.4	17.0	18.3	2.7	59

28/12/17

03/12/17

08/01/18

11.9

120

<5

8.98

0.10

0.720

2.1

2.80

5.51

5.75

674

190

89.6

23.2

19.9

21.2

3.2

67

Table 1b continued: Treated wastewater discharge quality – EPA Point No.6 – electric pump irrigation to Mt Kennedy

Measure	Frequency	Received	Accessible	BOD	TSS	O&G	pH	NH ₃	NO _x	TKN	TN	SRP	TP	EC	FC	Na	Ca	K	Mg	SAR	Cl
	required by licence	from laboratory	on Council website by	mg/L	mg/L	mg/L		mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	µS/cm	CFU/ mL	mg/L	mg/L	mg/L	mg/L		mg/L
90 percentile concentration				20	30	10															
EPA Point No. 6 – electric pump irrigation to Mt Kennedy	Monthly (M) /Quarterly (Q)			M	M	M	M	NR	NR	NR	M	NR	M	M	M	Q	Q	Q	Q	Q	Q
31/01/18		07/02/18	08/02/18	12.8	28	<5	8.40	.88	1.41	4.0	5.4	5.68	5.78	670	50	81.3	27.4	20.0	21.0	2.8	62
28/02/18		7/03/18	14/03/18	8.6	13	<5	7.91	7.04	1.51	8.9	10.4	7.36	7.96	710	380	75.8	30.5	19.6	20.5	2.6	56
28/03/18		04/04/18	23/04/18	15.9	15	<5	7.84	11.5	4.11	10.8	14.9	8.03	7.96	771	430	76.6	32.4	20.5	21.2	2.6	69
27/04/18		08/05/18	8/05/18	7.2	30	<5	8.18	6.96	4.94	8.9	13.8	5.31	5.37	728	1200	74.1	2.6	19.5	20.9	2.6	58
31/05/18		06/06/18	08/06/18	11.6	5	<5	7.59	11.3	7.0	13.1	20.1	5.64	5.75	786	240	82.2	31.1	21.6	22.9	2.7	63
28/06/18		05/07/18	09/07/18	9.0	8	<5	7.74	15.1	8.83	15.7	24.5	5.43	5.47	814	100	79.7	31.8	22.4	27.1	2.5	63
31/07/18		17/08/18	27/08/18	15.9	23	<5	8.17	3.06	2.10	15.5	17.6	4.47	4.86	834	400	79.3	31.7	20.4	22.2	2.6	63
31/08/18		07/09/18	12/09/18	20	15	<5	7.71	18.0	7.06	22.2	29.3	5.61	5.83	833	550	71.9	32.9	21.7	24.2	2.3	64
29/09/18		3/10/18	12/10/18	8.3	10	<5	7.78	14.2	7.98	18.6	26.6	4.49	5.26	776	480	66.7	34.7	20.3	21.8	2.2	57
30/10/18		7/11/18	13/11/18	9.0	5	<5	7.68	9.3	5.41	12.1	17.5	4.0	4.11	698	60	67.6	30.8	17.2	21.9	2.3	50
30/11/18		8/12/18	14/12/18	11.0	18	<5	8.20	2.80	1.79	5.1	6.9	2.75	2.91	660	210	76.3	34	19.0	27.3	2.4	54
31/12/18		7/01/19	8/01/19	15	60	<5	7.93	1.27	0.12	8.1	8.2	5.14	5.44	670	45	77.7	31.1	17.5	24.1	2.5	59
29/01/19		4/02/19	22/02/19	14.9	28	<5	8.05	2.91	2.69	8.4	11.1	5.87	6.16	739	200	81.4	31.4	22.1	24.1	2.7	69
28/02/19		6/03/19	14/03/19	11.3	50	<5	8.38	5.0	1.40	10.9	12.3	6.98	7.65	813	380	88.8	33.0	88.8	24.4	2.9	74
29/03/19		4/04/19	05/04/19	13.1	53	<5	8.02	3.77	3.55	5.9	9.4	5.75	6.53	807	560	80.0	38.1	24.3	26.3	2.4	70
26/04/19		2/05/19	10/05/19	11.9	13	<5	7.30	6.19	3.34	6.0	9.3	5.27	5.37	789	280	77.4	36.2	22.9	25.4	2.4	74
31/05/19		10/05/19	12/06/19	7.0	5	<5	7.92	9.45	8.98	5.5	14.5	5.11	5.74	851	147	92.1	38.3	25.6	28.8	2.7	77
26/06/19		12/06/19	25/06/19	9.0	8	<5	7.57	11.6	3.28	27.2	30.5	4.41	4.71	933	1731	88.2	37.7	25.7	27.6	2.7	76
31/07/19		7/08/19	8/08/19	9.2	10	<5	7.74	14.4	2.27	24.2	26.5	5.64	6.02	936	268	91.6	37.1	25.5	27.5	2.8	78
29/08/19		3/09/19	5/09/19	8.0	15	<5	8.33	21.6	5.95	22.1	28.1	5.55	6.52	911	105	88.5	39	26.0	27.8	2.6	76
27/09/19		08/11/19	8/11/19	3.0	18	<5	8.90	1.67	4.46	14.2	18.7	5.02	5.70	821	40	96.2	36.1	27.3	30.8	2.8	66
31/10/19		6/10/19	8/11/19	15.5	55	<5	8.68	14.4	1.66	18.9	20.6	6.47	7.69	826	92	91.3	39.7	28.8	30.2	2.7	79

Table 1c: Treated wastewater discharge quality – EPA Point No.7 – diesel pump irrigation to Windways

Measure	Frequency required by licence	Received from laboratory	Accessible on Council website by	BOD	TSS	O&G	pH	NH3	NOx	TKN	TN	SRP	TP	EC	FC	Na	Ca	K	Mg	SAR	Cl
				mg/L	mg/L	mg/L		mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	µS/cm	CFU/mL	mg/L	mg/L	mg/L	mg/L		mg/L
90 percentile concentration				20	30	10															
EPA Point No. 7 – diesel pump irrigation to Windways	Monthly (M) /Quarterly (Q)			M	M	M	M	NR	NR	NR	M	NR	M	M	M	Q	Q	Q	Q	Q	Q
29/01/15		11/02/15	17/02/15	1	18	<5	8.12	0.95	0.98	2.9	3.9	6.24	6.47	692	320	96.7	29.2	24.6	19.2	3.4	72
26/02/15		04/03/15	04/03/05	3.9	10	<5	7.80	7.03	6.72	3.7	10.4	7.00	7.42	762	56	88.8	34.5	29.9	27.4	2.7	68
31/03/15		06/04/15	13/04/15	6.9	20	<5	7.68	8.43	13.3	11	24.3	7.15	7.21	831	396	91	33.9	25.4	24.6	2.9	69
30/04/15		6/05/15	7/05/15	5.7	5	<5	7.73	11.55	15.6	11.6	27.2	6.20	6.67	815	344	88	33.9	23	22.8	2.9	63
28/05/15		2/06/15	05/06/15	5.5	8	<5	7.49	11.6	15	12.6	27.6	5.25	6.09	784	1200	78.9	32.4	21.9	20.5	2.7	59
30/06/15		06/07/15	07/07/15	4.5	3	<5	7.52	9.25	19.6	10.3	29.9	6.10	6.20	646	160	82	35.9	21.9	22.2	2.7	55
30/07/15		28/08/15	10/09/15	2	3	<5	7.78	2.17	4.64	3.3	7.9	5.30	6.45	733	30	82.4	35.4	19.5	23.5	2.6	68
31/08/15		09/09/15	10/09/15	6.3	5	<5	7.69	12.7	9.16	18	27.2	4.42	5.98	727	1300	66.3	35.2	15.4	20.9	2.2	47
30/09/15		6/10/15	9/11/15	8.3	8	<5	7.64	12.8	15.1	17.1	32.2	6.49	6.58	829	440	85	29.3	20.5	21.6	2.8	63
30/10/15		6/11/15	9/11/15	5.1	10	<5	7.80	4.31	3.35	15	18.4	6.02	7.30	777	580	86.6	36	21.5	21.6	2.8	71
26/11/15		02/12/15	07/11/15	3.4	10	<5	7.94	1.58	2.13	3	5.10	7.52	7.81	755	30	88.8	36.3	22.1	21.8	2.9	69
29/12/15		3/01/16	07/01/16	3.8	18	<5	8.62	.19	1.12	2.0	3.1	5.94	6.84	722	50	88	34	21.9	21.2	2.9	70
28/01/16		6/02/16	12/02/16	2.4	33	<5	9.63	.28	.089	3	3.10	1.63	2.32	622	25	78.1	19.9	19.6	17.8	3.1	65
29/02/16		06/02/16	08/03/16	5.6	3	<5	7.77	6.46	6.03	8.1	14.1	6.01	6.55	747	180	78.5	32.7	21.9	20.5	2.7	61
31/03/16		11/04/16	14/04/16	7.5	18	<5	8.94	0.84	1.21	3.7	4.9	3.77	4.33	636	270	88.1	20.3	22.2	15.5	3.6	58
29/04/16		04/05/16	14/05/16	4.5	5	<5	7.63	20.	12.1	7.9	20	6.72	6.97	771	900	72.2	29.8	22.3	19.9	2.5	60
31/05/16		9/06/16	14/06/16	7.3	5	<5	7.70	12.9	10.6	21	31.6	6.79	6.91	780	1200	63.3	27.2	19.3	17.8	2.3	53
29/06/16		06/07/16	06/07/16	2.2	5	<	7.72	5.84	5.09	8.5	13.6	5.05	5.32	720	710	75.8	31.6	20.1	19.8	2.6	64
29/07/16		10/08/16	11/08/16	9	13	<5	7.7	5.58	6.69	7.4	14.1	4.21	4.62	718	765	72.4	32.7	19.5	21.4	2.4	62
31/08/16		09/09/16	14/09/16	16.4	10	<5	7.60	7.43	8.17	11.4	19.6	1.70	1.83	634	410	54.9	33.6	13	20.8	1.8	55
30/09/16		11/10/16	12/10/16	9.0	20	<5	8.39	5.8	10.2	7.5	17.7	3.14	3.55	626	100	56.5	29.8	13.9	16.4	2.1	55
31/10/16		13/11/16	14/11/16	10.1	5	<5	7.57	10.5	8.20	11.9	20.1	3.03	3.19	665	215	60.3	28.4	14.4	16.7	2.2	46
30/11/16		09/12/16	14/11/16	11.9	30	<5	8.56	5.75	4.63	6.6	11.2	2.83	3.52	650	230	71.2	24.5	16.7	16.2	2.7	56
28/12/16		05/01/16	10/01/16	3.3	3	<5	9.37	0.97	2.15	2.6	4.8	1.89	2.11	585	32	68	22.4	15.4	16.9	2.6	59
31/01/17		12/02/17	16/02/17	4.5	8	<5	8.32	1.30	.612	4.2	4.80	6.14	6.12	680	65	74.9	29.3	18.5	18.7	2.7	65
28/02/17		15/02/17	15/02/17	17.3	60	<5	8.58	0.54	2.35	10.0	12.3	3.91	4.99	582	330	88.0	25.0	20.6	22.5	3.1	65
30/03/17		7/04/17	05/05/17	23.3	10	<5	8.14	2.60	3.37	7.9	11.3	4.41	4.44	565	1100	70.2	26.6	16.2	16.5	2.6	51
28/04/17		7/04/17	05/05/17	6.5	20	<5	8.07	1.22	1.09	2.3	3.1	6.76	6.98	624	65	74.6	30.6	17.9	18.8	2.6	59
31/05/17		6/06/17	6/06/17	8	5.0	<5	7.60	23.7	12.7	11.0	23.7	4.80	4.89	708	1250	66.5	26.3	17.1	15.3	2.5	52
29/06/17		04/07/17	12/07/17	7.1	8	<5	7.59	11.1	9.01	13.1	22.1	5.42	6.67	726	TNC	64	29.2	16.6	16.9	2.3	56
31/07/17		14/08/17	16/08/17	9.9	8	<5	7.63	13.2	12.9	9.7	22.6	5.10	5.37	807	825	71.5	30.4	16.7	17.6	2.6	55
31/08/17		07/09/17	11/09/17	6.2	5	<5	7.78	12.7	6.65	21.5	28.1	4.36	5.74	845	30	76.8	31.2	18.1	23.2	2.5	59
28/09/17		05/10/17	11/10/17	5.4	13	<5	7.71	12.6	6.24	27.7	33.9	6.19	6.65	828	230	74.6	29.5	18.1	17.4	2.7	62
31/10/17		08/11/17	09/11/17	5.0	5	<5	8.11	4.43	8.84	7.2	16.0	4.58	4.81	706	280	70.2	26.8	15.5	17.4	2.5	58
30/11/17		7/11/17	11/12/17	5.5	10	<5	8.70	2.40	4.05	3.8	7.5	4.53	4.59	691	560	73.8	27	17.6	18.7	2.7	61

28/12/17

03/12/17

08/01/18

6.8

8

<5

7.86

9.30

4.60

8.4

13.0

5.25

5.46

741

90

80.6

24.1

18.3

19.5

3.0

56

Table 1c continued: Treated wastewater discharge quality – EPA Point No.7 – diesel pump irrigation to Windways

Measure	Frequency required by licence	Received from laboratory	Accessible on Council website by	BOD mg/L	TSS mg/L	O&G mg/L	pH	NH3 mg/L as N	NOx mg/L as N	TKN mg/L as N	TN mg/L	SRP mg/L	TP mg/L	EC µS/cm	FC CFU/mL	Na mg/L	Ca mg/L	K mg/L	Mg mg/L	SAR	Cl mg/L
90 percentile concentration				20	30	10															
EPA Point No. 7 – diesel pump irrigation to Windways	Monthly (M) /Quarterly (Q)			M	M	M	M	NR	NR	NR	M	NR	M	M	M	Q	Q	Q	Q	Q	Q
31/01/18		07/02/18	08/02/18	21.9	35	<5	8.37	6.36	3.93	10.1	14.0	5.89	6.37	725	550	80.4	29.1	19.3	20.5	2.8	60
28/02/18		7/03/18	14/03/18	5.4	10	<5	7.98	4.77	0.210	6.9	7.1	8.70	9.02	750	800	88.1	31.3	20.1	22.2	2.9	66
28/03/18		04/04/18	23/04/18	11.0	20	<5	7.72	12.2	6.27	16.3	22.6	6.98	6.57	791	630	75.2	29	21.0	20.5	2.6	62
27/04/18		08/05/18	8/05/18	7.3	10	<5	7.85	10.1	7.33	12.0	19.3	5.98	6.25	759	1600	75.0	31.0	19.2	21.0	2.5	60
31/05/18		06/06/18	08/06/18	6.2	5	<5	7.72	12.9	18.0	7.0	25.0	5.78	6.10	808	1150	81.9	31.8	20.4	22.7	2.7	62
28/06/18		05/07/18	09/07/18	3.0	5	<5	7.89	3.37	5.52	4.0	9.5	5.18	5.26	776	100	86.3	34.2	21.3	24.6	2.7	71
31/07/18		17/08/18	27/08/18	6.1	15	<5	7.81	6.74	1.92	14.7	16.6	3.57	4.56	780	1220	81.1	31.9	20.0	22.2	2.7	70
31/08/18		07/09/18	12/09/18	11.7	8	<5	8.12	7.83	7.78	10.2	18	4.28	4.46	783	360	79.9	34.3	21.1	24.2	2.6	70
29/09/18		3/10/18	12/10/18	5.0	8	<5	8.10	1.54	3.83	3.4	7.2	3.73	3.88	780	75	85.2	36.4	21.8	22.8	2.7	69
30/10/18		7/11/18	13/11/18	4.9	5	<5	8.38	0.90	2.59	3.8	6.4	4.33	4.49	711	25	85.5	34.5	20.3	24.5	2.7	64
30/11/18		8/12/18	14/12/18	4.8	10	<5	7.92	2.02	1.35	2.6	3.9	4.81	5.67	722	80	91.9	37.1	22.1	28.7	2.8	68
31/12/18		7/01/19	8/01/19	4.8	5	<5	7.85	8.15	0.34	13.7	14.0	5.19	5.33	768	310	73.1	31.5	20.9	24.4	2.4	63
29/01/19		4/02/19	22/02/19	9.0	10	<5	7.82	8.36	1.63	14.7	16.3	5.86	6.14	754	440	75.3	31.0	20.3	22.3	2.5	62
28/02/19		6/03/19	14/03/19	6.8	23	<5	7.89	12.5	3.04	19.1	22.1	5.32	5.40	836	1450	84.7	33.3	22.1	23.3	2.8	67
29/03/19		4/04/19	05/04/19	4.5	5	<5	8.04	1.58	2.84	3.6	6.4	7.78	8.48	814	447	87.3	37.4	23.5	27.1	2.7	81
26/04/19		2/05/19	10/05/19	3.3	2	<5	8.12	0.47	3.73	2.1	5.8	6.35	6.98	802	30	86.0	37.5	23.2	27.0	2.6	679
31/05/19		10/05/19	12/06/19	8.6	5	<5	7.84	11.2	14.6	9.5	24.1	6.03	6.60	933	1410	93.5	40.4	26.5	29.4	2.7	79
26/06/19		12/06/19	25/06/19	11.6	18	<5	7.58	16.2	5.26	41.5	46.8	5.38	5.41	784	1200	88.2	41.9	26.9	28.6	2.6	79
31/07/19		7/08/19	8/08/19	4.8	8	<5	7.89	2.27	0.60	6.3	6.9	3.18	3.81	846	100	98.8	38.9	23.7	28.2	2.9	70
29/08/19		3/09/19	5/09/19	3.0	15	<5	9.28	0.9	2.29	27	5.0	2.43	2.72	777	10	97.9	37.3	23.7	27.9	3.0	86
27/09/19		08/11/19	8/11/19	11.1	15	<5	7.67	18.8	8.72	24.6	13.3	4.77	5.56	919	440	85.6	36.7	25.0	28.9	2.6	66
31/10/19		6/10/19	8/11/19	8.9	25	<5	9.20	0.86	1.32	4.48	5.8	3.71	3.84	744	40	104.8	31.0	26.8	29.4	3.2	90

Table 2: Soil monitoring of different soil types in irrigation areas – ongoing – 3 yearly

Measure	Frequency required by licence	Received from laboratory	Accessible on Council website by	Location	Stability (Emerson) description	Ex Ca mg/kg	Ex K mg/kg	Ex Mg mg/kg	Ex Na mg/kg	ESP %	pHw	pHca	EC dS/cm	OM as Org C %	Extractable Phosphorus mg/kg	NO ₃ (Mineral N) mg/kg	PSC kg/ha
EPA Point No. 2 3 yearly (Rotated Mt Kennedy areas locations)																	
June 2012		23/06/12	03/12/12	Surface (MK2 g)	water stable, swell	844	87	191	68	4.6	5.34	4.82	0.239	1.91	47.4	116	1600
June 2012		23/06/12	03/12/12	Subsoil (MK2 h)	slake 2	457	30	390	170	11.6	6.76	5.38	0.047	0.21	0.01	0.99	5800
June 2012		23/06/12	03/12/12	Surface (MK4 a)	water stable, no swell	1178	103	411	191	7.9	6.53	5.66	0.112	1.74	5.63	6.14	3400
June 2012		23/06/12	03/12/12	Subsoil (MK4 b)	slake 2	710	302	527	330	13.9	6.45	5.44	0.171	0.47	0.07	0.29	11400
June 2012		23/06/12	03/12/12	Surface (MK6 a)	water stable, no swell	1496	263	399	193	6.8	6.48	5.81	0.157	3.79	33.8	19.2	1400
June 2012		23/06/12	03/12/12	Subsoil (MK6 b)	slake 2	625	112	316	143	9.4	7.17	5.98	0.060	0.34	2.87	0.13	6100
June 2012		23/06/12	03/12/12	Surface (MK7 a)	water stable, no swell	1145	339	384	185	7.6	6.90	6.00	0.159	2.27	17.6	7.13	2100
June 2012		23/06/12	03/12/12	Subsoil (MK7 b)	slake 2	561	60	323	239	15.6	7.21	5.94	0.093	0.46	1.07	0.14	10600
June 2012		23/06/12	03/12/12	Surface (Creek A 13 a)	water stable, no swell	1287	220	411	133	5.3	6.90	5.98	0.123	3.08	34.5	11.9	1200
June 2012		23/06/12	03/12/12	Subsoil (Creek A 13 b)	slake 2	900	74	833	215	7.5	7.26	5.95	0.075	0.55	0.47	0.09	10900
June 2012		23/06/12	03/12/12	Surface (Creek A 14 a)	water stable, no swell	2489	187	646	91	2.1	6.07	5.28	0.099	4.44	56.1	2.44	1700
June 2012		23/06/12	03/12/12	Subsoil (Creek A 14 b)	slake 3	2533	71	499	195	4.8	6.84	6.06	0.173	0.88	49.2	0.10	1800
June 2012		23/06/12	03/12/12	Surface (Creek B 15 a)	water stable, no swell	1293	211	424	107	4.2	6.39	5.56	0.106	1.76	1.87	1.33	2000
June 2012		23/06/12	03/12/12	Subsoil (Creek B 15 b)	slake 2	2417	184	820	465	9.5	6.53	5.87	0.287	0.76	0.03	0.05	11700
June 2014		18/06/14	07/07/14	Surface 5 Tower 2c	water stable, swell	1015	128	332	96	4.8	7.4	5.79	0.131	2.82	39.1	27.8	1300
June 2014		18/06/14	07/07/14	Subsoil 5 Tower 2d	slake 3	693	64	398	261	13.7	7.55	5.80	0.113	0.94	0.46	2.40	14900
June 2014		18/06/14	07/07/14	Surface Fescue 1 3a	water stable, swell	1198	156	442	113	4.6	7.35	5.86	0.120	3.86	24.9	11.4	1700
June 2014		18/06/14	07/07/14	Subsoil Fescue 1 3b	slake 3	584	51	852	439	15.4	7.53	5.46	0.091	0.38	0.01	0.77	11000
June 2014		18/06/14	07/07/14	Surface East Paddock 5c	water stable, no swell	1654	485	394	102	3.3	6.97	5.79	0.189	4.36	39.4	33.0	1200
June 2014		18/06/14	07/07/14	Subsoil East Paddock 5d	slake 2	643	114	239	75	5.6	7.43	5.59	0.050	0.94	4.0	1.9	2900
June 2014		18/06/14	07/07/14	Surface Rye 3 – 8a	water stable, swell	1277	171	424	94	3.8	7.12	5.86	0.120	3.53	33.2	13.1	1400
June 2014		18/06/14	07/07/14	Subsoil Rye 3 – 8b	class 1	815	47	384	197	10.4	7.60	5.97	0.069	0.72	1.4	0.99	8300
June 2014		18/06/14	07/07/14	Surface Rye 4 – 9a	water stable, no swell	1413	326	455	92	3.3	7.07	6.01	0.183	4.63	47.1	30.05	700
June 2014		18/06/14	07/07/14	Subsoil Rye 4 – 9b	disperse class 2	319	59	175	158	17.6	7.72	6.07	0.071	0.27	0.8	1.06	2900
EPA Point No. 4 3 yearly (Rotated Windways areas locations)																	
June 2012		23/06/12	03/12/12	Surface (WW-1c)	water stable, swell	1098	62	360	124	5.8	6.12	5.58	0.098	1.83	7.08	6.52	1500
June 2012		23/06/12	03/12/12	Subsoil (WW - 1d)	slake 1	1284	67	740	282	8.8	6.80	5.60	0.069	0.44	0.31	0.07	6300
June 2012		23/06/12	03/12/12	Surface (Creek C 16a)	water stable, no swell	2010	259	698	135	3.4	6.18	5.35	0.138	3.36	3.51	0.45	2100
June 2012		23/06/12	03/12/12	Subsoil (Creek C 16b)	slake 2	2494	118	988	224	6.7	7.87	5.32	0.058	0.62	0.7	1.4	3700
June 2014		18/06/14	07/07/14	Surface (WW-1a)	water stable, swell	976	87	296	104	5.3	7.53	5.15	0.099	2.85	21.8	13.8	1100
June 2014		18/06/14	07/07/14	Subsoil (WW 1b)	slake 1	1017	89	971	224	6.7	7.87	5.32	0.058	0.62	0.7	1.4	3000
June 2014		18/06/14	07/07/14	Creek Nth – 16a	water stable, no swell	1752	229	638	87	2.5	6.98	5.80	0.069	3.85	4.64	0.34	2000
June 2014		18/06/14	07/07/14	Creek Nth – 16b	slake 1	2232	74	904	258	5.6	7.19	5.97	0.136	1.04	0.66	0.85	2600

Table 3: Treated wastewater discharge & irrigation volumes

Frequency required by licence	Reporting month	Month's Total	Lowest daily volume	Mean daily volume	Greatest daily volume	Frequency required by licence	Reporting month	Month's Total	Lowest daily volume	Mean daily volume	Greatest daily volume	Accessible on Council website
Electronic measure		kL	kL/day	kL/day	kL/day	Electronic measure		kL	kL/day	kL/day	kL/day	
EPA Point No. 1 (Commissioners Waters)	/daily					EPA Points Nos. 3 & 5 (Mt Kennedy & Windways irrigation areas)	daily					
	Jan 2015	112214	0	3619.8	10954		Jan 2015	34472	0	1112	5344	17/02/15
	Feb 2015	55820	256	1993.6	4158		Feb 2015	13920	0	497.1	2326	04/03/15
	Mar 2015	20540	0	662.6	4358.0		Mar 2015	115545	0	3727	5644	7/04/15
	Apr 2015	92168	0	3072.3	8474.0		Apr 2015	37205	0	1240	5545	7/05/15
	May 2015	118806	1668	3832.5	6260		May 2015	22706	0	732.5	2839.	05/06/15
	Jun 2015	124944	3046	4164.8	9534.0		Jun 2015	8	0	0	8	07/07/15
	Jul 2015	140010	736	4668	11480		Jul 2015	64865	0	2092.4	3601	09/09/15
	Aug 2015	185132	764	5972	23488		Aug 2015	66174	0	2135	9131.00	09/09/15
	Sep 2015	122164	0	4072.1	16384		Sep 2015	71109	0	1185	3131	09/11/15
	Oct 2015	118806	1668	3832	6260		Oct 2015	53758	0	1734	4128	09/11/15
	Nov 2015	65582	0	2186.1	9126		Nov 2015	72628	0	1210	7224	07/12/15
	Dec 2015	20932	0	675.2	5264		Dec 2015	105474	729	3402	5507	07/01/16
	Jan 2016	84566	0	2727.9	5682		Jan 2016	43748	0	1411	5746	12/02/16
	Feb 2016	55216	0	1972	5938		Feb 2016	83247	0	2775	3965	08/03/16
	Mar 2016	0	0	0	0		Mar 2016	145126	2791	4681	5866	14/04/16
	Apr 2016	1882	0	62.7	283		Apr 2016	104874	1350	3496	5488	14/05/16
	May 2016	35740	0	11529	4356		May 2016	79545	783	2566	4693	14/06/16
	Jun 2016	78834	1032	2627	5804		Jun 2016	18138	0	605	3827	06/07/16
	Jul 2016	210967	4592	6805	14510		Jul 2016	17024	0	549	3031	11/08/16
	Aug 2016	387957	6371	12514.7	27000		Aug 2016	57274	0	1848	13523	14/09/16
	Sep 2016	204042	4710	6801.4	10054		Sep 2016	0	0	0	0	12/10/16
	Oct 2016	158488	2476	5112.5	9324		Oct 2016	0	0	0	0	14/11/16
	Nov 2016	66558	0	2218.6	12770		Nov 2016	83746	0	2792	5318	14/12/16
	Dec 2016	19260	0	642	5276		Dec 2016	127345	2465	4108	5299	10/01/17
	Jan 2017	6269.6	0	783.7	1575.1		Jan 2017	120587	1641	3890	5203	16/02/17
	Feb 2017	81596	1878	2914	3629		Feb 2017	129897	3049	4639	5641	16/03/17
	Mar 2017	230936	8.0	7449.5	36286		Mar 2017	68603	0	2213	5275	05/05/17
	Apr 2017	212397.6	258.6	7079.9	23504.0		Apr 2017	15309.2	0	510	5110	05/05/17
	May 2017	173222	3560	5587.8	9178		May 2017	32272	0	1041	3084	06/06/17
	Jun 2017	213060.0	3998.0	7346.9	35692		Jun 2017	20497	0	683	2756	12/07/17
	Jul 2017	258636	5978	8343	22468		Jul 2017	1187	0	38	688	16/08/17
	Aug 2017	96242	1454	3104.6	6304		Aug 2017	88455	0	2853	4063	11/09/17
	Sep 2017	40420	0	1347.3	5146		Sep 2017	122623	150	4087	5822	11/10/17
	Oct 2017	132521.6	0	4274.9	13688.0		Oct 2017	66147	0	2134	5316	09/11/17
	Nov 2017	34900.0	0	1163.3	4330.0		Nov 2017	113989	396	3800	5648	11/12/17
	Dec 2017	15698	0	523.3	2338.0		Dec 2017	136237	2531	4395	5807	08/01/18

Frequency of measurement required by licence is daily, and the daily limits are 10,000 kL for discharge to Commissioners Waters; and 5,000 kL for only EPA Point 3, the Mt Kennedy irrigation areas.

Table 3 continued: Treated wastewater discharge & irrigation volumes

Frequency required by licence	Reporting month	Month's Total	Lowest daily volume	Mean daily volume	Greatest daily volume	Frequency required by licence	Reporting month	Month's Total	Lowest daily volume	Mean daily volume	Greatest daily volume	Accessible on Council website
Electronic measure		kL	kL/day	kL/day	kL/day	Electronic measure		kL	kL/day	kL/day	kL/day	
EPA Point No. 1 (Commissioners Waters)	/daily					EPA Points Nos. 3 & 5 (Mt Kennedy & Windways irrigation areas)	daily					
	Jan 2018	0	0	0	0		Jan 2018	139368	2574	4496	6420	08/02/18
	Feb 2018	8006	0	286	4332		Feb 2018	118678	1194	4239	5899	14/03/18
	Mar 2018	30778	0	992.8	3582		Mar 2018	129098	0	4164	6022	23/04/18
	Apr 2018	1628	0	54.3	884		Apr 2018	142490	2504	4750	5920	08/05/18
	May 2018	47470	0	1531.3	4672		May 2018	110339	0	3559	5558	08/06/18
	Jun 2018	74592	0	2486.4	5500		Jun 2018	82562	629	2752	4889	09/07/18
	July 2018	153394	2422	4948	8914		July 2018	34559	0	1115	3025	27/08/18
	Aug 2018	87340	0	2817.4	7398		Aug 2018	84460	0	2725	5117	12/09/18
	Sep 2018	101640	0	3388	10038		Sep 2018	648114	0	2160	5538	12/10/18
	Oct 2018	156528	1004	5049.3	10174		Oct 2018	61343	0	1979	5195	13/11/18
	Nov 2018	58794.0	170	1959.8	4366		Nov 2018	130409	2542	4347	5912	14/12/18
	Dec 2018	55088.0	88	1836.3	6522		Dec 2018	118789	1212	3832	5953	08/01/19
	Jan 2019	6706	0	216.3	1870		Jan 2019	118399	8	3819	7115	22/02/19
	Feb 2019	0	0	0	0		Feb 2019	136600	1993	4879	6264	14/03/19
	Mar 2019	0	0	0	0		Mar 2019	127882	0	4125	6190	05/04/19
	Apr 2019	362	0	12.1	201		Apr 2019	127152	2489	4238	5987	10/05/19
	May 2019	28206	0	909.9	2440		May 2019	112442	322	3627	5340	12/06/19
	June 2019	43170	0	1439	3634		Jun 2019	85197	1194	2840	5477	25/07/19
	July 2019	56712	0	1829	3894		July 2019	83608	843	2697	5547	08/08/19
	Aug 2019	32068	0	1034	3014		Aug 2019	106936	1587	3450	5915	05/09/19
	Sep 2019	0	0	0	0		Sep 2019	117227	968	3908	6127	8/11/19
	Oct 2019	0	0	0	0		Oct 2019	113231	1023	3653	5600	8/11/19

Table 4: Biosolids sludge volume monitoring

Frequency required by licence	Reporting month	Sludge lagoons	to Mt Kennedy areas	to Windways areas	Accessible on Council website
Measure		kL (~m ³)	kL (~m ³)	kL (~m ³)	
EPA Point No. 8	daily during discharge				
	Jan 2015	no desludging			21/03/14
	Feb 2015	no desludging			12/04/14
	Mar 2015	no desludging			09/05/14
	Apr 2015	no desludging			16/06/14
	May 2015	360		360	07/07/14
	Jun 2015	1100	350	750	08/08/14
	Jul 2015	no desludging			04/09/14
	Aug 2015	no desludging			04/10/14
	Sep 2015	no desludging			17/11/14
	Oct 2015	no desludging			11/12/14
	Nov 2015	no desludging			17/02/15
	Dec 2015	no desludging			17/02/15
	Jan 2016	no desludging			04/03/15
	Feb 2016	no desludging			07/04/15
	Mar 2016	no desludging			7/05/15
	Apr 2016	no desludging			05/06/15
	May 2016	no desludging			07/07/15
	Jun 2016	680	680		09/08/15
	July 2016	260		260	09/09/15
	Aug 2016	no desludging			09/10/15
	Sep 2016	no desludging			09/11/15
	Oct 2016	no desludging			
	Nov 2016	no desludging			07/12/15
	Dec 2016	no desludging			07/01/16

Table 4: continued

Frequency required by licence	Reporting month	Sludge lagoons	to Mt Kennedy areas	to Windways areas	Accessible on Council website
Measure		kL (~m ³)	kL (~m ³)	kL (~m ³)	
EPA Point No. 8	daily during discharge				
	Jan 2018	No desludging			08/02/18
	Feb 2018	No desludging			14/03/18
	Mar 2018	No desludging			23/04/18
	Apr 2018	No desludging			08/05/18
	May 2018	720	680	40	08/06/18
	June 2018	650		650	09/07/18
	July 2018	140		140	27/08/18
	Aug 2018	1140		1140	12/09/18
	Sep 2018	No desludging			12/10/18
	Oct 2018	No desludging			13/11/18
	Nov 2018	No desludging			14/12/18
	Dec 2018	No desludging			08/01/19
	Jan 2019	No desludging			22/02/19
	Feb 2019	No desludging			14/03/19
	Mar 2019	No desludging			05/04/19
	Apr 2019	No desludging			10/05/19
	May 2019	No desludging			12/06/19
	Jun 2019	No desludging			25/07/19
	July 2019	No desludging			08/09/19
	Aug 2019	No desludging			05/09/19
	Sep 2019	No desludging			08/11/19
	Oct 2019	No desludging			08/11/19

Table 5: Biosolids sludge quality monitoring

Frequency Reporting required by licence month		Ca	Cl	EC	Mg	Moisture	NO ₃	TN	TP	K	Na	SAR	S	pH	Received from laboratory	Accessible on Council website
Measure		mg/kg	mg/kg	us/cm	mg/kg	as % DW	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ratio	mg/kg	1-14		
EPA Point No. 9	quarterly (every third month of discharge)															
	Mar 2014	34780	1143	3170	4810	13.2	224	25320	22590	1830	1120	1.5	6250	7.04	4/07/14	07/07/14
	Jul 2014	23045	1750	3450	3120	12.1	126	21480	12185	1103	1370	2.3	5220	7.33	6/08/14	08/08/14
	Aug 2014	37710	91	2800	9240	24.8	670	31250	30380	2285	2358	2.8	10960	7.17	11/08/16	25/08/16
Lagoon 3	Jun 2017	20150	225	2920	3190	6.2	1120	29850	17121	2236	2569	4.44	6700	7.06	13/08/17	13/07/17
Lagoon 2	Aug 2017	24504	2553	3590	3497	6.3	736	32120	17744	2170	2632	4.2	9.259	7.24	13/08/17	13/08/17
Lagoon 2	Jun 2018	28195	2210	3230	4282	4.1	60.0	44700	18284	2359	3347	4.9	9608	7.33	21/06/18	09/07/18
Lagoon 3	Aug 2018	14624	1510	3.35	4246	3.30	690	4.22	17288	2585	4651	8.7	7297	8.18	13/09/18	12/10/18

Table 6a: Groundwater quality & depth – WW1, WW2, WW3

Wells	Frequency required by licence	DO	EC	pH	Eh	Temp	D	WL	RL
Measure		mg/L	µS/cm	1-14	mV	°C	m	m	m
WW1 6 monthly									
17/03/16		0.31	1749	6.88	+123	16.7	11.61	965.32	
01/12/16		1.27	1632	6.98	+178	17.2	10.51	966.42	
28/03/17		1.27	1613	6.75	+51	17.2	10.50	966.43	
05/10/17		1.13	1551	6.83	+187	10.4	10.22	966.71	
02/04/18		1.01	1571	6.82	-22	21.2	10.80	966.13	
03/01/19		0.24	1596	7.13	+141	18.5	11.48	965.45	
12/04/19		1.00	1593	6.94	+103	17.2	11.67	965.26	
19/09/19		0.78	1651	6.96	+123	17.9	11.89	965.04	
WW2 6 monthly									
17/03/16		0.16	1305	6.98	+128	17.3	1.98	953.00	
01/12/16		0.21	1326	7.16	+129	16.3	1.63	953.35	
28/03/17		0.18	1326	6.89	+27	18.3	0.94	954.04	
05/10/17		0.00	1308	6.99	+171	8.2	1.38	953.60	
02/04/18		0.20	1228	6.93	+84	21.1	1.83	953.15	
03/01/19		0.10	1305	7.20	+158	18.6	1.93	953.05	
12/04/19		0.16	1294	7.00	+121	16.0	2.13	952.85	
19/09/19		0.15	1298	7.01	+107	16.5	2.05	952.93	
WW3 6 monthly									
17/03/16		0.25	954	8.15	-20	17.5	2.36	953.44	
01/12/16		1.16	968	7.89	-52	16.8	1.69	954.11	
28/03/17		0.35	968	8.48	+51	19.5	1.48	954.32	
05/10/17		0.75	951	8.05	-125	8.6	1.37	954.43	
02/04/18		0.89	901	8.66	-186	22.1	2.17	953.63	
03/01/19		0.23	949	8.09	-125	18.0	2.45	953.35	
12/04/19		0.54	918	7.99	-75	16.2	2.70	953.10	
19/09/19		0.68	930	7.69	-44	17.3	2.72	953.08	

Received from laboratory	Accessible on Council website by	NO _x	TKN	TN	TP
		mg/L as N	mg/L as N	mg/L	mg/L
WW1					
30/03/16	19/04/16	2.30	0.3	2.6	<0.01
08/12/16	30/12/16	2.42	0.3	2.7	0.02
06/04/17	01/05/17	2.10	0.2	2.3	<0.01
12/10/17	01/11/17	1.82	0.3	2.1	0.02
09/04/18	27/04/18	1.86	0.4	2.3	0.02
17/01/19	08/02/19	1.32	0.2	1.5	0.02
24/04/19	15/05/19	1.20	0.2	1.4	0.02
26/09/19	11/10/19	1.06	0.2	1.3	0.01
WW2					
30/03/16	19/04/16	0.04	<0.1	<0.1	0.04
08/12/16	30/12/16	0.05	<0.1	<0.1	<0.01
06/04/17	01/05/17	0.04	<0.1	<0.1	<0.01
12/10/17	01/11/17	0.04	<0.1	<0.1	<0.01
09/04/18	27/04/18	0.06	<0.1	<0.1	<0.01
17/01/19	08/02/19	0.06	<0.1	<0.1	<0.01
24/04/19	15/05/19	0.05	<0.1	<0.1	<0.01
26/09/19	11/10/19	0.03	<0.1	<0.1	<0.01
WW3					
30/03/16	19/04/16	0.44	<0.1	0.4	<0.01
08/12/16	30/12/16	0.31	<0.1	0.3	0.04
06/04/17	01/05/17	0.18	<0.1	0.2	<0.01
12/10/17	01/11/17	0.18	<0.1	0.2	0.04
09/04/18	27/04/18	0.57	0.2	0.8	0.03
17/01/19	08/02/19	0.32	0.1	0.4	0.04
24/04/19	15/05/19	0.51	<0.1	0.5	0.04
26/09/19	11/10/19	0.30	<0.1	0.3	0.02

Table 6c: Groundwater quality & depth – P14, P17

Wells	Frequency required by licence	DO	EC	pH	Eh	Temp	D	WL RL
Measure		mg/L	µS/cm	1-14	mV	°C	m	m
P14 6 monthly								
17/03/16		6.70	447	6.65	+244	21.0	1.38	959.69
01/12/16		4.66	561	6.88	+169	23.1	2.16	958.91
28/03/17		4.07	466	6.58	+133	22.3	1.48	959.59
05/10/17		4.75	616	7.31	+224	16.9	1.41	959.66
02/04/18		3.95	462	7.21	-45	23.4	2.67	958.40
03/01/19		4.92	716	7.13	+187	22.1	2.28	958.79
15/04/19		5.73	601	7.13	+221	19.3	2.73	958.34
19/09/19		7.69	681	6.95	+140	16.0	2.53	958.54
P17 6 monthly								
17/03/16		3.07	2886	7.43	+197	19.8	3.77	953.87
01/12/16		1.79	3055	7.40	+187	17.9	3.07	954.57
28/03/17		1.96	3045	7.11	+176	21.7	3.36	954.28
05/10/17		4.46	2955	6.88	+147	15.7	3.30	954.34
02/04/18		3.22	2877	7.10	+40	21.2	3.28	954.36
03/01/19		2.25	2896	7.47	+214	19.3	3.27	954.37
15/04/19		2.63	2662	7.50	+242	19.0	1.73	955.91
19/09/19		5.51	2503	7.67	+170	16.7	3.48	954.16

Received from laboratory	Accessible on Council website by	NO _x	TKN	TN	TP
		mg/L as N	mg/L as N	mg/L	mg/L
P14					
30/03/16	19/04/16	0.22	0.5	0.7	0.19
08/12/16	30/12/16	1.32	0.5	1.8	0.18
06/04/17	01/05/17	1.77	1.0	2.8	0.18
12/10/17	01/11/17	3.08	0.7	3.8	0.16
09/04/18	27/04/18	1.98	0.6	2.6	0.23
17/01/19	08/02/19	3.85	0.9	4.8	0.16
24/04/19	15/05/19	3.61	0.8	4.4	0.16
26/09/19	11/10/19	5.24	0.8	6.0	0.14
P17					
30/03/16	19/04/16	3.28	0.7	4.0	0.10
08/12/16	30/12/16	7.10	1.1	8.2	0.13
06/04/17	01/05/17	5.06	0.8	5.9	<0.05
12/10/17	01/11/17	6.73	0.9	7.6	0.08
09/04/18	27/04/18	5.91	0.6	6.5	0.11
17/01/19	08/02/19	4.78	0.6	5.4	0.10
24/04/19	15/05/19	4.48	0.6	5.1	0.11
26/09/19	11/10/19	4.35	0.4	4.8	0.10