Remediation (NZ) Ltd.
Think of it as a State of the Art Fertiliser Production Facility

URUTI COMPOSTING & VERMICULTURE FACILITY

Leachate & Stormwater Management Plan

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V1.1	26-7-2018	Draft for review	C Kay		
V1.2	27-8-2018	Draft for review	C Kay		
V1.3	10-9-2018	Draft for review	C Kay		

Table of Content

0.0 Terms and Definitions

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1.0 Purpose of the Plan

The purpose of this document is to outline how the pond system that treats leachate generated from the compost pile and contaminated stormwater from pads 1 and 3 and the Truck Washdown area is managed.

2.0 General

The pad 1 and 3 pond system comprise of three separate ponds systems

- Pad 3 treatments ponds comprising:
  - Dewatering and settling pond
  - Silt collection pond
  - Skim pond
  - Settling ponds 1 & 2
  - Irrigation pond
- Duck pond
- Washdown settling pond

3.0 Resource consent conditions

Condition 14 Before 30 November 2015 the holder shall review and update the Uruti Composting Facility management Plan supplied in support of application 5838-2.2 and any changes shall be submitted for approval to the TRC. The plan shall be adhered to and reviewed on an annual basis (or as required) and any changes shall be submitted to the TRC. The plan shall include but not limited to;

a) Trigger limits for the three tier management system tiers set out in section 3.1 of the Uruti Composting Facility Management Plan
b) Monitoring frequencies of soil and groundwater in Tiers one, two, and three.
c) Remediation options for Tier three irrigation areas;
d) Riparian planting of irrigation areas;
e) Stormwater improvements at the site;
f) Water storage for dilution and remediation;
g) Soil and ground water analysis; and

Condition 20 The consent holder shall prepare a Pond Treatment System Management Plan which details management practices undertaken to maximise treatment capabilities of the system. The plan shall be submitted for approval to the TRC, within one month of the commencement date of this consent.

The Management Plan shall address but not necessarily be limited to, the following matters:

How the build-up of sediment and/or sludge will be managed within the entire system, how the level of build-up will be monitored including factors that will trigger management, and the frequency of undertaking the identified measures or procedures;

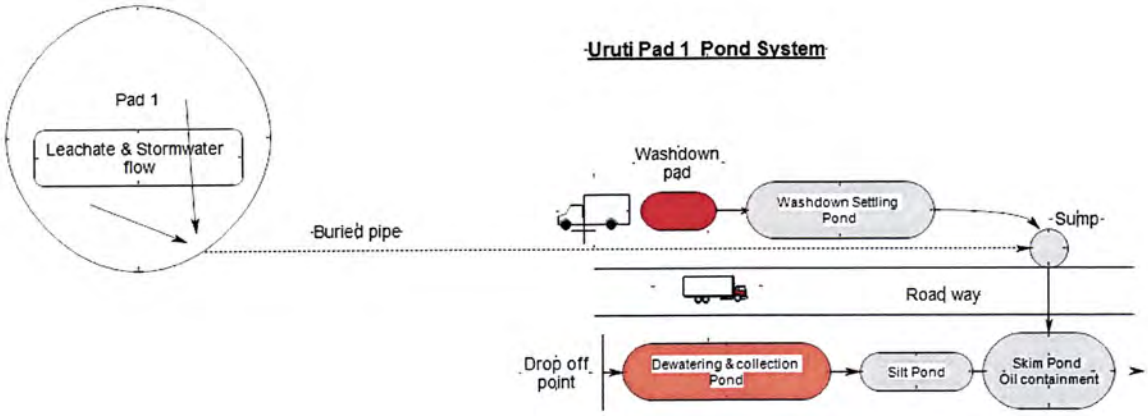
How overloading of the system will be prevented; and

How any offensive or objectionable odours at or beyond the boundary will be avoided in accordance with condition 13 of consent 5839-2

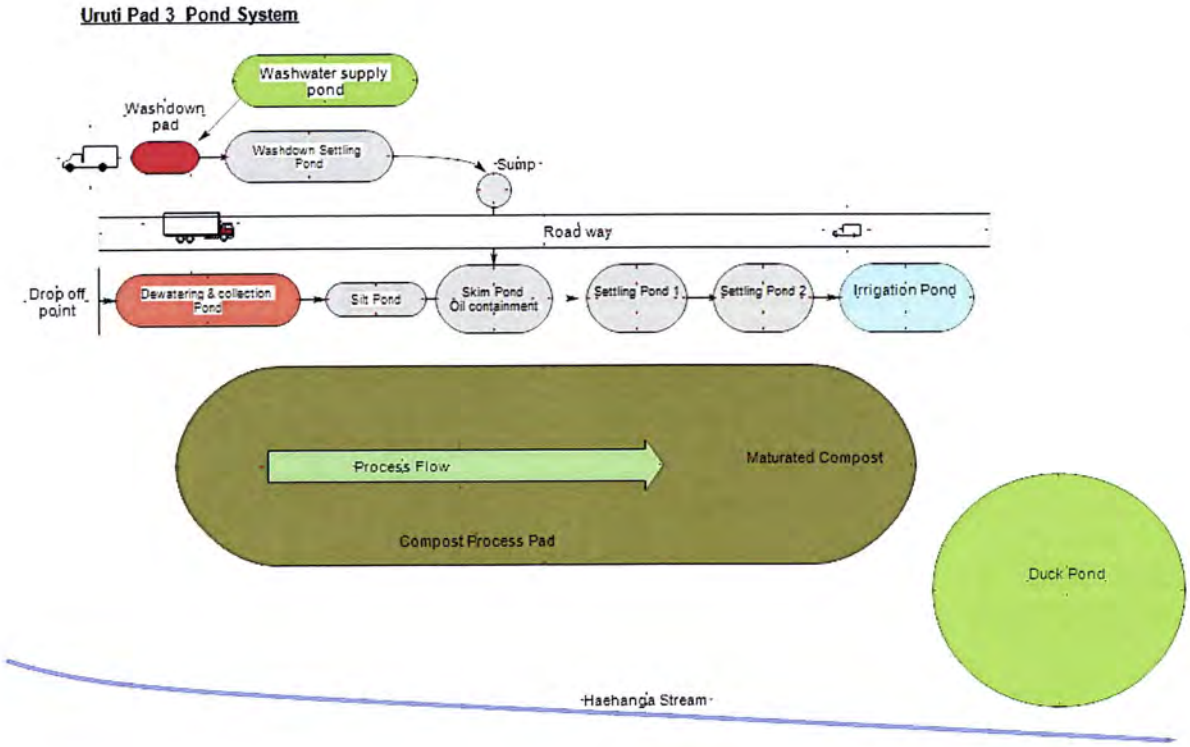
Condition 21 Operations on site shall be undertaken in accordance with the Pond Treatment System Management Plan, approved under condition 18 above, except in

circumstances when the proposed Implementation Plan, approved under condition 9 of consent 5839-2, specifies otherwise.

3.1 Pad 1



3.2 Pad 3



3.3 Pond Management Plan

3.3.1 Purpose of the Plan

This document describes the role of each pond system and provides instructions for the operation and maintenance for each system

3.3.2 Pond system inspection

Each pond is inspected daily to ensure the pond levels are maintained and there is no unplanned liquid overflow and the solids or sediment in each pond are below the planned maximum levels.

3.3.3 Dewatering and settling pond system

3.3.1.1 General

Organic waste is deposited onto Pad 1 or the mixing area. This organic waste is mixed with sawdust and greenwaste and deposited onto the compost pile. Surplus liquids are collected in the dewatering and collection pond. Liquids overflow into a series of settling and treatment ponds and eventually flow into the Irrigation pond. The pond levels are maintained by a series of T weirs at the pond discharge.

3.3.1.2 Operational and Maintenance

1) Dewatering and Collection Pond

   Daily - Scoop out the freshly deposited organic wastes and deposit onto the compost pile

   Monthly - Scoop out sediment from the pond and deposit onto the compost pile

2) Silt Pond

   Monthly – scoop out and deposit into the dewatering and collection pond

3) Skim Pond

   Monthly – skim hydrocarbons from the pond and deposit into the hydrocarbon collection tank

   Annually – Scoop out sediment and deposit into dewatering and collection pond

4) Settling pond 1 & 2

   Annually – Scoop out sediment and deposit into dewatering and collection pond

5) Irrigation pond

   Annually – Scoop out sediment and deposit into dewatering and collection pond

3.3.4 Duck pond

3.3.1.3 General

The duck pond maintains its level by ground soakage. Water from the duck pond is pumped into the irrigation pond during dry conditions to maintain dilution levels in the irrigation liquid and to the washdown supply pond to maintain minimum pond levels to provide washdown water during dry conditions.

3.3.5 Washdown settling pond

3.3.5.1 General

The washdown pad is used to clean trucks after they have dumped their load of organic waste. Wash water is pumped from the washdown supply pond. Runoff liquids from the wash are collected in the washdown settling pond and the pond overflow flows to the collection sump and then into the skim pond

3.3.5.2 Operational and Maintenance

Six monthly – scoop out sediment and deposit into dewatering and collection pond.

3.4 Irrigation Block Management Plan

3.4.1 Purpose of the Plan

The purpose of this document is to provide the methodology and procedures to ensure the waste water from the Irrigation Pond is irrigated onto the irrigation block in compliance with consent conditions

3.4.2 Resource Consent Conditions

Condition 8 The consent holder shall record the following information in association with irrigating waste water to land:
a) The date, time and hours of irrigation;
b) The volume of waste water irrigated to land;
c) The conductivity of the irrigation fluid (measured in mS/m)
d) The source of the waste water [e.g. Pond or Wetland Treatment System]; and
e) The location and extent where the wastewater was irrigated.

Condition 9 There shall be no direct discharge to water as a result of irrigating wastewater to land. This includes, but not necessarily limited to, ensuring the following:

a) No irrigation shall occur closer than 25 m to any surface water body;
b) The discharge does not result in surface ponding;
c) No spray drift enters surface water;
d) The discharge does not occur at a rate at which it cannot be assimilated by the soil/pasture system; and
e) The pasture cover within irrigation areas is maintained at all times.

Condition 10 treated wastewater discharged by irrigation to land shall not have a hydrocarbon content exceeding 5% total petroleum hydrocarbon or a sodium adsorption ratio exceeding 18.

Condition 11 Discharges irrigated to land shall not give rise to any of the following adverse effects on the Haehanga Stream, after a mixing zone extending 30 m from the downstream extent of the irrigation areas;

a) A rise in filtered carbonaceous biochemical oxygen demand of more than 2.00 gm-3,
b) A level of unionised ammonia greater than 0.0025 gm-3,
c) An increase in total recoverable hydrocarbons;
d) Chloride levels greater than 150g/m3
e) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

f) Any conspicuous change in the colour visual clarity;
g) Any emissions of objectionable odour;
h) The rendering of fresh water unsuitable for consumption by farm animals; and
i) Any significant adverse effects on aquatic life.

3.4.3 Climate

NIWA virtual Climate Station -38.975, 174.525 Thirty years of rainfall and evaporation data is summarised in Table 1 below

Table 1: NIWA Virtual Climate Station 30-year data for a site near Uruti Site

Uruti	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Rainfall	120.0	107.0	119.2	151.2	181.2	189.5	181.8	178.0	175.4	188.4	149.4	149.0	1890.
Evaporation	134.5	108.0	88.6	52.7	31.1	21.4	25.4	39.0	57.5	85.1	109.3	126.0	878.6

3.4.4 Irrigation area

The Irrigation block consists of 5 areas as outlined in Appendix 22 as areas E to F.

The area sizes are shown in Table 2 below

Table 2: Irrigation block areas

Area	Ha
E	1.590
J	1.428
H	1.150
G	1.475
F	1.338
Total area	6.981

3.4.5 Soils

The soils in the effluent blocks were classified by BTW Company in the June 2015 report as Orthic brown soils from the Whangamomona Complex loams. A field survey by BTW Company using soil augers identified the top soil as Light brown grey silty clay and the subsoil as Light grey silty clay.

The soil texture was assessed by feel[1] during the KCL site visit as a silty clay loam as shown in Figure 1.

[1] Undertaken in general accordance with methodology described in 'Soil Description Handbook' Milne et al. (1995)

Figure 1. Photos showing test pit.

The assessment of the soils in the test pits indicated the top 300 mm of the soil profile consisted of 300 mm of a silty clay loam. The presence of mottles and gleying in the profile indicates that drainage is impeded.

3.4.1.1 Application Depth

It is important that the volume of effluent applied during each application does not exceed the water holding capacity of the soil in the plants root zone. The soil's Profile Available Water in the top 30 cm (PAW_{30}) describes the maximum amount of water that can be held in the soil that is extractable by plants (i.e. plant available water).

The soils PAW_{30} was calculated using the methodology from the Farm Dairy Effluent Design Code of Practice FDEDCOP at 50 mm.

Industry good management practice is to restrict irrigation depth to less than 50% of PAW_{30}

Therefore, the maximum application depth is 25 mm.

As the irrigator does not distribute effluent evenly over the entire wetted area, in order to prevent over irrigating, the application depth is reduced by the distribution uniformity coefficient (DU). The FDEDCOP requires irrigators to achieve a DU of 1.25

Using a DU of 1.25 this gives an adjusted application depth **(Dt) of 20.0 mm.**

3.4.1.2 Application Rate

The FDE Design Code of Practice states that the maximum application rate must not exceed the soil infiltration rate. If effluent is applied at a rate greater than the soils infiltration capacity, effluent will pond on the soil surface and there is a risk of run off into surface water ways.

The soil infiltration rate was calculated using the methodology from the FDE Design Code of Practice at 12 mm/hr when using a watering time of 30 minutes.

Solids in FDE have the potential to reduce the soils infiltration rate by physically blocking the surface pores. The application rate is adjusted by the infiltration rate adjustment coefficient which takes into account the soil texture and the FDE percent solids. The range of solids

content in FDE was reported in the NZ Journal of Agricultural Research[2] as 0.5 – 1.2% dry matter. For design purposes a dry matter of 1% has been selected for this evaluation.

Silty clay loam and effluent with 1% solids gives an infiltration rate adjustment coefficient of 1.0.

Incorporating the losses gives a system design application rate **Ra = 12.00 mm/hr.**

3.4.1.3 Soil Chemistry

The BTW company report Uruti Composting Facility Management Plan (undated) developed a framework based on a three-tier decision tree which guides site operations in response to trigger levels of soil contaminants. The tiered response was developed because of its simplicity but also allows increased monitoring efforts and reviews of site performance to minimise risks from drainage to groundwater and accumulation of hydrocarbon constituents within the soil.

The three-tier framework is summarised in table 3 below.

Table 3: Three Tier response guidelines

Tier	Operation Status of irrigated area
One	Surveillance or normal operation of site
Two	Alert or increased level of monitoring with deferred irrigation
Three	Action or remediation options initiated and irrigation ceases

The trigger or threshold values and actions required are listed in the BTW company report in Appendix 23. The threshold values are summarised in table 4 below.

Table 4: Summary of the Three Tier threshold values for soil chemistry

Tier Level	Chloride	Total Petroleum Hydrocarbons (TPH)	SAR
	mg/kg	mg/kg	
One	0 – 700		0 – 6
Two	700 – 1,800	<20,000	6 – 18
Three	>1,800	>20,000	>18

[2] R. D. Longhurst, A. H. C. Roberts & M. B. O'Connor (2000): Farm dairy effluent:
A review of published data on chemical and physical characteristics in New Zealand, New Zealand Journal of Agricultural Research, 43:1, 7-14

3.4.2 Irrigation Model

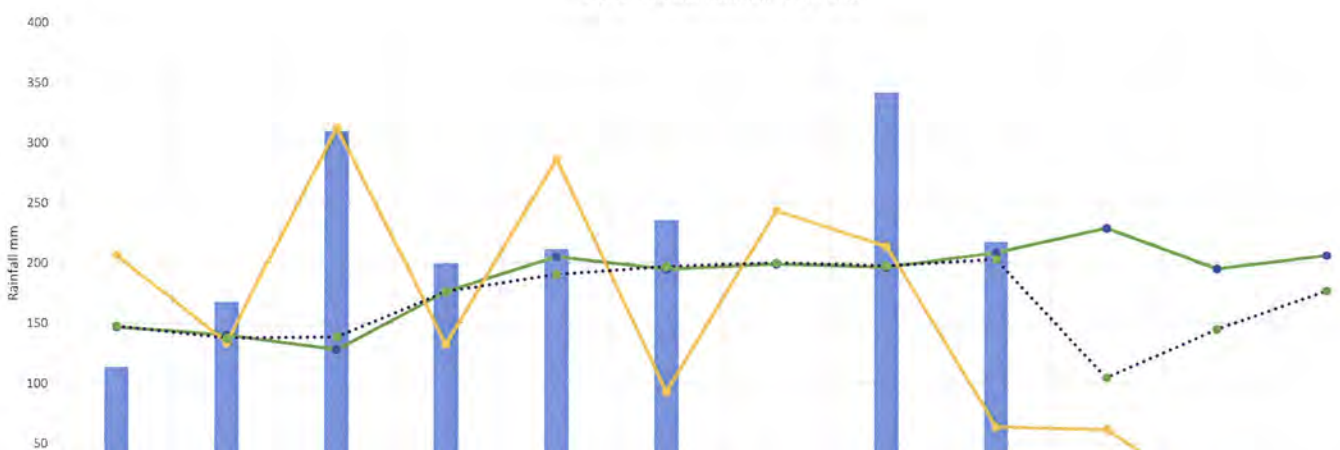
The Irrigation Model is designed to proactively manage the pond levels. We receive predicted 30-day rainfall data from a Weather Forecaster on a weekly basis. We receive this data on Monday mornings and using the predicted rainfall data calculate the volume of stormwater that is predicted to arrive in the irrigation pond during the following week i.e. days 8 to 14. The irrigation plan is updated each Monday morning to account for this volume and the pond level is reduced during the week by irrigation to a level at the end of the week where the pond will have sufficient capacity to cope with the following weeks predicted rainfall.

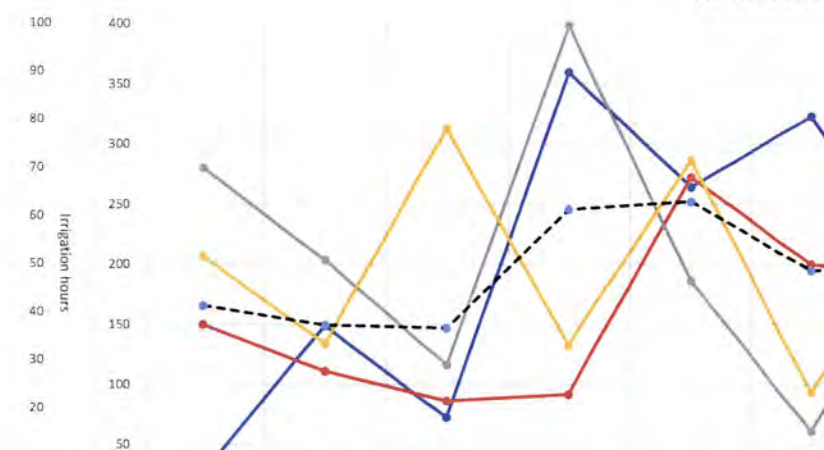
We also receive a 3-monthly forecast which predicts the weather to be wetter than normal, normal or wetter than normal. The average rainfall data is entered into the model and multiplied by a correction factor to account for 3-month prediction e.g. normal = 0, wetter than normal + 10% and drier than normal = -10%.

The irrigation model is attached in Appendix A

3.4.3

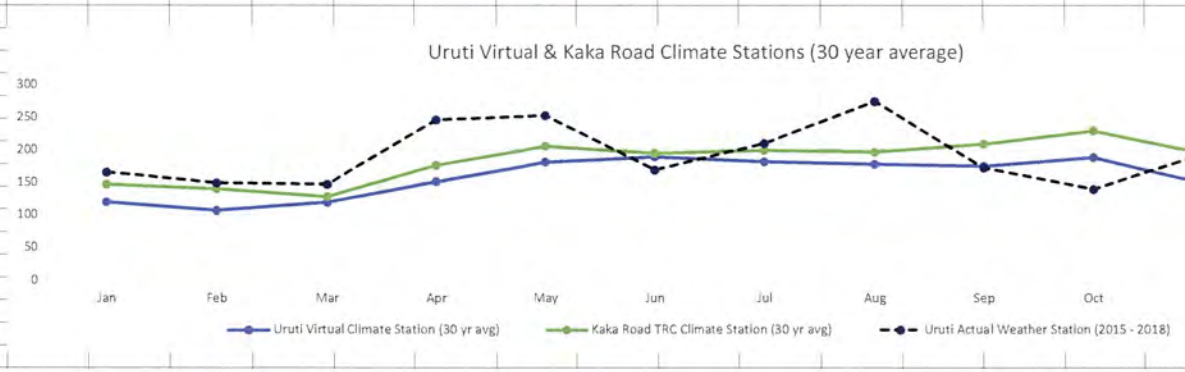
Predicted Rain	Week 2	Predicted	33.24	45.60	45.10	44.49	48.88	0.00	41.27	46.73	33.33	35.20	29.07	41.27	41.27	
	Week 3	Predicted	33.24	45.60	45.10	44.49	48.88	7.71	41.27	46.73	33.33	35.20	29.07	41.27	41.27	
	Week 4	Predicted	33.24	45.60	45.10	44.49	48.88	18.51	41.27	46.73	33.33	35.20	29.07	41.27	41.27	
		Predicted	132.95	182.41	180.42	177.97	195.51	61.12	151.89	186.94	133.32	140.79	116.29	165.09	165.09	1,989.79
	1		186.03	182.41	180.42	177.97	195.51	207.59	182.78	186.94	133.32	140.79	116.29	165.09	165.09	2,220.23
Rainfall falling onto the pads & ponds	Week 1		375.96	493.71	488.97	483.15	524.91	391.79	326.85	504.50	376.83	394.60	336.28	452.48	452.48	5,602.50
	Week 2		375.96	493.71	488.97	483.15	524.91	59.38	452.45	504.50	376.83	394.60	336.28	452.48	452.48	5,395.69
	Week 3		375.96	493.71	488.97	483.15	524.91	132.81	452.45	504.50	376.83	394.60	336.28	452.48	452.48	5,469.12
	Week 4		375.96	493.71	488.97	483.15	524.91	235.67	452.45	504.50	376.83	394.60	336.28	452.48	452.48	5,571.98
			1,503.83	1,974.83	1,955.88	1,932.59	2,099.63	819.64	1,684.20	2,017.99	1,507.31	1,578.41	1,345.13	1,809.92	1,809.92	22,039.29
																-
Less evaporation = Amount to be irrigated	Week 1		(338.62)	(468.02)	(458.46)	(436.30)	(455.93)	(289.72)	(195.66)	(353.28)	(215.47)	(265.03)	(229.91)	(389.30)	(389.30)	(4,485.00)
	Week 2		(338.62)	(468.02)	(458.46)	(436.30)	(455.93)	42.69	(321.26)	(353.28)	(215.47)	(265.03)	(229.91)	(389.30)	(389.30)	(4,278.19)
	Week 3		(338.62)	(468.02)	(458.46)	(436.30)	(455.93)	(30.74)	(321.26)	(353.28)	(215.47)	(265.03)	(229.91)	(389.30)	(389.30)	(4,351.62)
	Week 4		(338.62)	(468.02)	(458.46)	(436.30)	(455.93)	(133.61)	(321.26)	(353.28)	(215.47)	(265.03)	(229.91)	(389.30)	(389.30)	(4,454.49)
																(17,569.29)
			(1,354.47)	(1,872.06)	(1,833.82)	(1,745.20)	(1,823.72)	(411.38)	(1,159.46)	(1,413.13)	(861.89)	(1,060.14)	(919.63)	(1,557.19)	(1,557.19)	(17,569.29)
	Planned irrigation	Month	1,860.00	1,860.00	1,833.00	1,745.00	1,823.00	1,806.00	1,453.00	1,413.00	861.00	1,060.00	919.00	1,557.00	1,557.00	19,747.00	
		Week	465.00	465.00	458.25	436.25	455.75	451.50	363.25	353.25	215.25	265.00	229.75	389.25	389.25	4,936.75	19,747
Volume irrigated	Week 1	Entered	338.62	468.02	458.46	436.30	455.93	289.72	195.66	353.28	215.47	265.03	229.91	389.30	389.30	4,485.00	
	Week 2	Entered	338.62	468.02	458.46	436.30	455.93	(42.69)	321.26	353.28	215.47	265.03	229.91	389.30	389.30		
	Week 3	Entered	338.62	468.02	458.46	436.30	455.93	30.74	321.26	353.28	215.47	265.03	229.91	389.30	389.30		
	Week 4	Entered	338.62	468.02	458.46	436.30	455.93	133.61	321.26	353.28	215.47	265.03	229.91	389.30	389.30		
			1,354.47	1,872.06	1,833.82	1,745.20	1,823.72	411.38	1,159.46	1,413.13	861.89	1,060.14	919.63	1,557.19	1,557.19	17,569.29	
Pumping hours required per week	Week 1	Pumping	11.3	15.6	15.3	14.5	15.2	9.7	6.5	11.8	7.2	8.8	7.7	13.0	13.0		
	Week 2	Pumping	11.3	15.6	15.3	14.5	15.2	(1.4)	10.7	11.8	7.2	8.8	7.7	13.0	13.0		
	Week 3	Pumping	11.3	15.6	15.3	14.5	15.2	1.0	10.7	11.8	7.2	8.8	7.7	13.0	13.0		
	Week 4	Pumping	11.3	15.6	15.3	14.5	15.2	4.5	10.7	11.8	7.2	8.8	7.7	13.0	13.0		
			45.15	62.40	61.13	58.17	60.79	13.71	38.65	47.10	28.73	35.34	30.65	51.91	51.91	585.64	
																(585.64)	
Pond freeboard storage (M^3) at 1st day of month			1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0		
Surplus liquid			-	-	-	-	-	-	-	-	-	-	-	-	-		
Pond vol at end of month			1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0		
Pond vol per metre			1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0	1,300.0		
Pond depth (at beginning of month)			-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8		
Pond depth (at end of 4 week month)			-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8		



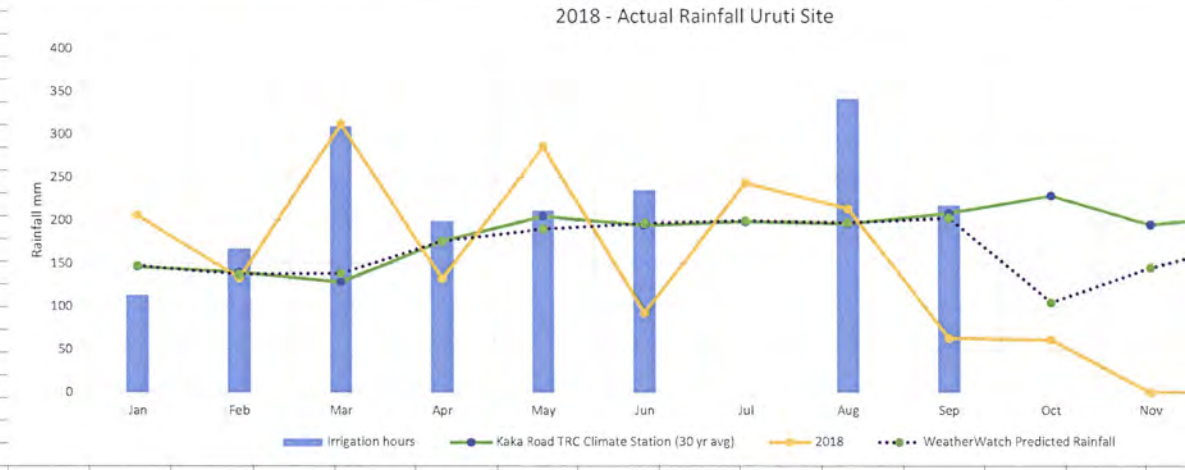


	Oct	133.6	175.6	109.4	61.4	139.53
	Nov	232.4	279	67.4	0	192.93
	Dec	72.8	105.6	64.8	0	81.07
Yearly Total		2288.8	2145.2	2259.2	1748.6	2198.48
						2231.07

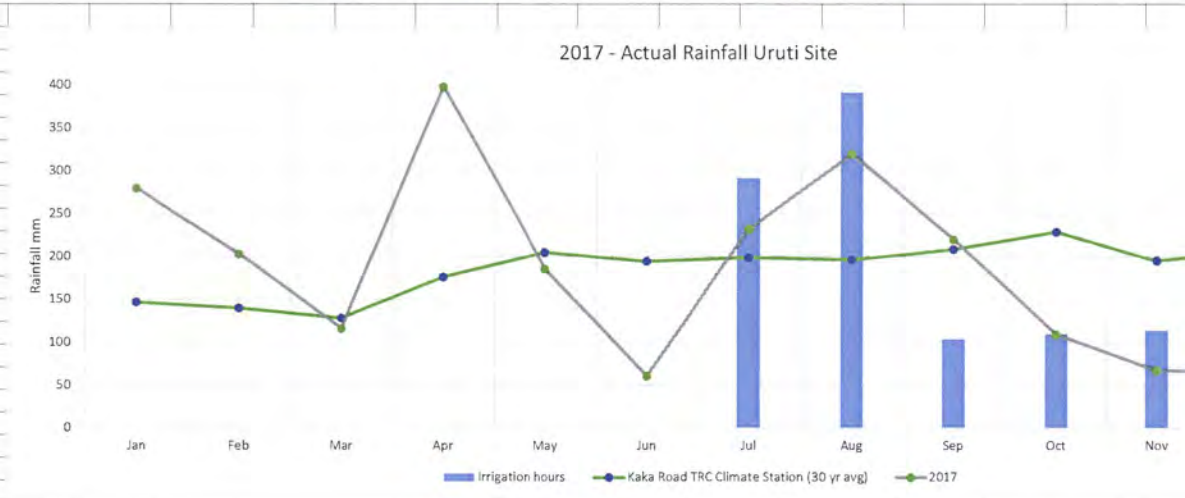
Uruti Virtual Climate Station (30 yr avg)	Jan	120
30 year average	Feb	107.02
	Mar	119.22
	Apr	151.25
	May	181.2
	Jun	189.51
	Jul	181.83
	Aug	178.04
	Sep	175.35
	Oct	188.38
	Nov	149.39
	Dec	149.04
		1890.23



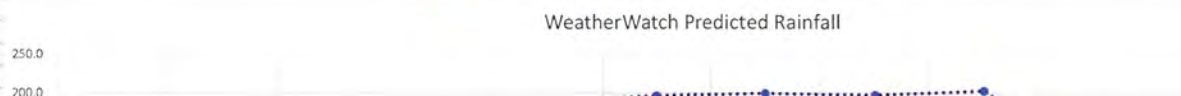
Kaka Road TRC Climate Station (30 yr avg)	Jan	147.20
30 year average	Feb	140.40
	Mar	128.40
	Apr	176.4
	May	205.4
	Jun	194.9
	Jul	199.2
	Aug	196.5
	Sep	208.9
	Oct	229.2
	Nov	195.3
	Dec	206.4
		2228.2



Irrigation hours		2015	2016	2017	2018
	Jan				28.5
	Feb				42
	Mar				77.5
	Apr				50
	May				53
	Jun				59
	Jul			73	
	Aug			98	85.5
	Sep			26	54.5
	Oct			27.5	
	Nov			28.5	
	Dec			25	



		Predicted 2018	Actual		%
WeatherWatch Predicted Rainfall	Jan	148.0	206.8	58.8	0.72
	Feb	137.8	134	-3.8	1.03
	Mar	138.8	312.7	173.9	0.44
	Apr	176.4	132.8	-43.6	1.33
	May	190.5	286.2	95.7	0.67
	Jun	197.1	93.2	-103.9	2.11
	Jul	200.3	243.8	43.5	0.82
	Aug	197.5	214.1	16.6	0.92
	Sep	203.3	63.6	-139.7	3.20
	Oct	104.9	61.4	-43.5	1.71
	Nov	145.0	0	-145.0	
	Dec	176.9	0	-176.9	
		2016.5	1748.6	1.3	




Pad 3
Drilling Mud &
Compost
Pad 2
Paunch
Pad 1
Compost
Treat