

LORIS H HASSALL TRADING PTY LTD – FORBES



LABORATORY RESULTS / SITE PLAN 2018

EPL # 12765

REPORTING PERIOD:

12-NOV-2017 to 12-NOV-2018

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1. TABLE OF CONTENT

EPA MONITORING REFQUENCY REQUIRED AND UNITS OF MEASURE TO BE TAKEN

SOIL SAMPLING SITES

POINT 1: IRRIGATION PIT SUMMARY OF RESULTS

POINT 2 & 5 & 6 : EVAPORATION DAMS 1 + 2 + 3 SUMMARY OF RESULTS

POINT 3: PIEZOMETERS SUMMARY OF RESULTS

POINT 4: SOIL SAMPLE SUMMARY OF RESULTS

LITRES IRRIGATED

POINT 2,5,6, LITRES TO DAMS

ANNUAL ANALYSIS: R1.8 2017/2018

AERIAL PHOTO + MAP OF 6 MONITORING POINTS

EPA MONITORING FREQUENCY

POINT 1,2,5,6

	Pollutant	Units of measure	Frequency	Sampling Method
<u>1</u>	BOD	milligrams per litre	Quarterly	Grab Sample
<u>2</u>	Calcium	milligrams per litre	Quarterly	Grab Sample
<u>3</u>	Chloride	milligrams per litre	Quarterly	Grab Sample
<u>4</u>	CONDUCTIVITY	microsiemens per centimetre	Quarterly	In situ
<u>5</u>	MAGNESIUM	milligrams per litre	Quarterly	Grab Sample
<u>6</u>	NITROGEN (total)	milligrams per litre	Quarterly	Grab Sample
<u>7</u>	OIL AND GREASE	milligrams per litre	Quarterly	Grab Sample
<u>8</u>	p H	p H	Quarterly	In situ
<u>9</u>	PHOSPHORUS (total)	milligrams per litre	Quarterly	Grab Sample
<u>10</u>	POTASSIUM	milligrams per litre	Quarterly	Grab Sample
<u>11</u>	SODIUM	milligrams per litre	Quarterly	Grab Sample
<u>12</u>	SODIUM ABSORPTION RATIO	sodium absorption ratio	Quarterly	Grab Sample

POINT 3

	Pollutant	Units of measure	Frequency	Sampling Method
<u>1</u>	CONDUCTIVITY	microsiemens per centimetre	Quarterly	In situ
<u>2</u>	NITROGEN (total)	milligrams per litre	Quarterly	Grab Sample
<u>3</u>	p H	p H	Quarterly	In situ
<u>4</u>	PHOSPHORUS (total)	milligrams per litre	Quarterly	Grab Sample
<u>5</u>	STANDING WATER LEVEL	metres	Quarterly	In situ

POINT 4

	Pollutant	Units of measure	Frequency	Sampling Method
<u>1</u>	AVAILABLE PHOSPHORUS	milligrams per kilogram	Yearly	Speical Method 1
<u>2</u>	CALCIUM	milligrams per litre	Yearly	Speical Method 1
<u>3</u>	CONDUCTIVITY	microsiemens per centimetre	Yearly	Speical Method 1
<u>4</u>	Exchangeable sodium %	percent	Yearly	Speical Method 1
<u>5</u>	MAGNESIUM	milligrams per litre	Yearly	Speical Method 1
<u>6</u>	NITRATE	milligrams per litre	Yearly	Speical Method 1
<u>7</u>	NITROGEN (total)	milligrams per kilogram	Yearly	Speical Method 1
<u>8</u>	p H	p H	Yearly	Speical Method 1
<u>9</u>	SODIUM ABSORPTION RATIO	sodium absorption ratio	Yearly	Speical Method 1

POINT 1 =- IRRIGATION PIT

TURN ON AND SAMPLE IS COLLECTED AT BOTTOM OF PIT. TIP PART INTO EACH BOTTLE.
 REPEAT EVERY 1/2 HOUR UNTIL SESL BOTTLES ARE FULL

POINT 2 & 5 & 6 = EVAP DAMS.

TAKE SAMPLE FROM DEEP AS POSSIBLE , TIP PART INTO EACH BOTTLE.
 REPEAT AT HALF DEPTH AND THEN JUST BELOW SURFACE UNTIL SESL BOTTLES ARE FULL, SEAL AND LABEL

COMPOSITE SOIL POINT 4

5 SAMPLES TO BE TAKEN
 25m2 AREA x 7 BAYS AT
 DEPTHS OF 0>10 CM +
 10>40CM
 SEAL AND LABEL

GPS SOIL SAMPLING SITES

LAT: LONG:	7	-33.332066 148.064235	N0-7
LAT: LONG:	6	-33.331922 148.063527	N0-6
LAT: LONG:	5	-33.331797 148.062883	N0-5
LAT: LONG:	4	-33.331698 148.062175	N0-4
LAT: LONG:	3	-33.331627 148.061467	N0-3
LAT: LONG:	2	-33.31519 148.060614	N0-2
LAT: LONG:	1	-33.33142 148.060008	N0-1

LH HASSALL TRADING P/L 812 PARKES RD. FORBES NSW

EPA REGISTER LINK:

<https://apps.epa.nsw.gov.au/npdesapp>

EFFLUENT ANALYSIS RECORD SHEET

LICENCE # 12765

REVISION:0

Refer **NEW POINTS FOR TESTING SITE PLAN AUG-18**

DATE: **12-Oct**

PUBLISHED: **10/12/2018**



POINT 1 - IRRIGATION PIT							
UNIT OF MEASURE	27/02/2018	17/04/2018	23/08/2018	13/11/2018	HIGH	LOW	AVE
BOD - mg/L	2980	3690	1880	2840	3690	1880	2848
Chloride - mg/L	5460	12797	6900	5150	12797	5460	7577
Total Kjeldahl Nitrogen - mg/L	639	1100	1060	726	1100	639	881
Oil & Grease (LLE) - mg/L	57	39	73	44	73	39	53
Total Phosphorus - mg/L	19.7	32.7	16.7	20.8	32.7	16.7	22
Potassium mg/L	64.4	223	95.4	87.6	223	64.4	118
Conductivity -microsiemens/per cm	20300	56400	27300	12800	56400	12800	29200
Sodium - mg/L	3850	6453	4610	2870	6453	2870	4446
(Ph)	12.1	12.33	9.38	12	12.33	9.38	11
Calcium - mg/L	218	175	19.1	131	218	19.1	136
Magnesium - mg/L	0.105	0.4	4.97	1.47	4.97	.105	2
Sodium Absorption Ratio	72	134	243	68	243	68	129

DATE TAKEN:
 TIME TAKE:
 TAKEN BY:
 SESL REPORT:

27/02/2018	17/04/2018	21/08/2018	13/11/2018
7:00 AM	7:00 AM	7:00 AM	8.30 am
MARK	MARK	BRENDAN	MARK
8/05/2018	3/05/2018	6/09/2018	29/11/2018

LH HASSALL TRADING P/L 812 PARKES RD. FORBES NSW

EPA REGISTER LINK: <https://apps.epa.nsw.gov.au/prpoeoapp>

EVAPORATION DAM MONITORING RECORD

LICENCE #; LICENCE # 12765

NSW30180

Refer NEW POINTS FOR TESTING SITE PLAN AUG-18

DATE: 12/10/2018 PUBLISHED: 10/12/2018

APPENDIX C



POINT 2 - EVAPORATION DAM 1							
UNIT OF MEASURE	27/02/2018	17/04/2018	21/08/2018	13/11/2018	1st sml		
					HIGH	LOW	AVE
BOD - mg/L	3610	20900	4630	EMPTY	20900	3610	9713
Chloride - mg/L	182000	196869	190000	EMPTY	196869	182000	189623
Total Kjeldahl Nitrogen - mg/L	1650	2360	1950	EMPTY	2360	1650	1987
Oil & Grease (LLE) - mg/L	18	32	22	EMPTY	32	18	24
Total Phosphorus - mg/L	155	211	174	EMPTY	211	155	180
Potassium mg/L	2720	4460	3970	EMPTY	4460	2720	3717
Conductivity -microsiemens/per cm	577000	623000	622000	EMPTY	623000	577000	607333
Sodium - mg/L	108000	104084	104000	EMPTY	108000	104000	105361
(Ph)	7.25	6.82	6.75	EMPTY	7.47	6.75	7
Calcium - mg/L	28.8	162	68.1	EMPTY	162	28.8	86
Magnesium - mg/L	41.8	166	87.1	EMPTY	166	41.8	98
Sodium Absorption Ratio	3008	1372	1962	EMPTY	3008	1372	2114

DATE TAKEN:

TIME TAKE:

TAKEN BY:

SESL REPORT:

27/02/2018	17/04/2018	21/08/2018	13/11/2018
7.30 am	7.30 am	7.30 am	9:00 AM
MARK	MARK	MARK	MARK
8/03/2018	3/05/2018	6/09/2018	29/11/2018

POINT 5 - EVAPORATION DAM 2							
UNIT OF MEASURE	27/02/2018	17/04/2018	21/08/2018	13/11/2018	2nd sml		
					HIGH	LOW	AVE
BOD - mg/L	10800	17200	2800	3710	17200	2800	8628
Chloride - mg/L	208000	192846	167000	189000	208000	167000	189212
Total Kjeldahl Nitrogen - mg/L	1180	1690	564	543	1690	543	994
Oil & Grease (LLE) - mg/L	13	14	16	6	16	6	12
Total Phosphorus - mg/L	89.2	134	15.5	20.6	134	15.5	65
Potassium mg/L	2230	3240	930	1010	3240	930	1853
Conductivity -microsiemens/per cm	592000	574000	494000	408000	592000	408000	517000
Sodium - mg/L	112000	108018	96300	106000	112000	96300	105580
(Ph)	7.29	7.03	7.12	7.47	7.29	7.03	7
Calcium - mg/L	55.5	131	40.7	139	131	40.7	92
Magnesium - mg/L	60.8	131	45.8	78.1	131	45.8	79
Sodium Absorption Ratio	2478	1597	2461	1789	2478	1597	2081

DATE TAKEN:

TIME TAKE:

TAKEN BY:

SESL REPORT:

27/02/2018	17/04/2018	21/08/2018	13/11/2018
8:00 AM	8:00 AM	8:00 AM	9:00 AM
MARK	MARK	MARK	MARK
8/03/2018	3/05/2018	6/09/2018	29/11/2018

POINT 6 - EVAPORATION DAM 3							
UNIT OF MEASURE	27/02/2018	17/04/2018	21/08/2018	13/11/2018	Big dam		
					HIGH	LOW	AVE
BOD - mg/L			9960	11400	11400	9960	10680
Chloride - mg/L		EMPTY	190000	190000	190000	190000	190000
Total Kjeldahl Nitrogen - mg/L			1430	1220	1430	1220	1325
Oil & Grease (LLE) - mg/L			22	19	22	19	21
Total Phosphorus - mg/L			96.4	104	104	96.4	100
Potassium mg/L			2120	1580	2120	1580	1850
Conductivity -microsiemens/per cm			555000	385000	555000	385000	470000
Sodium - mg/L			105000	113000	113000	105000	109000
(Ph)			7.03	7.15	7.15	7.03	7
Calcium - mg/L			61.9	134	134	61.9	98
Magnesium - mg/L			63.9	96.1	96.1	63.9	80
Sodium Absorption Ratio			2230	1816	2230	1816	2023

DATE TAKEN:

TIME TAKE:

TAKEN BY:

SESL REPORT:

		21/08/2018	13/11/2018
		8.30 AM	9.15 AM
		MARK	MARK
		6/09/2018	29/11/2018

LH HASSALL TRADING P/L 812 PARKES RD. FORBES NSW

EPA REGISTER LINK: <https://apps.epa.nsw.gov.au/eprosocapp>

PIEZOMETER ANALYSIS RECORD LICENCE # 12765

REVISION 0

PUBLISHED: 12/10/2018

12/10/2018



POINT 3 - PIZOMETERS

ANALYSIS	PIEZOMETER 1					PIEZOMETER 2				
	Mar-18	Sep-18	HIGH	LOW	AVE	Mar-18	Sep-18	HIGH	LOW	AVE
Chromium Total - mg/L										
Electrical Conductivity - µS/m										
Nitrogen Total - mg/L										
pH - pH units										
Phosphorus Total - mg/L										
Redox Potential										
Standing Water Level - m										
Sulphide - mg/L										
ANALYSIS	PIEZOMETER 3					PIEZOMETER 4				
	Mar-18	Sep-18	HIGH	LOW	AVE	Mar-18	Sep-18	HIGH	LOW	AVE
Chromium Total - mg/L										
Electrical Conductivity - dS/m										
Nitrogen Total - mg/L										
pH - pH units										
Phosphorus Total - mg/L										
Redox Potential										
Standing Water Level - m										
Sulphide Total - mg/L										
ANALYSIS	PIEZOMETER 5					PIEZOMETER 6				
	Mar-18	Sep-18	HIGH	LOW	AVE	Mar-18	Sep-18	HIGH	LOW	AVE
Chromium Total - mg/L										
Electrical Conductivity - dS/m										
Nitrogen Total - mg/L										
pH - pH units										
Phosphorus Total - mg/L										
Redox Potential										
Standing Water Level - m										
Sulphide Total - mg/L										

DATE TAKEN:	13/03/2018	19/09/2018
TIME TAKE:	10:00 AM	11:00 AM
TAKEN BY:	MARK	MARK
SESL REPORT:	NA	NA

LH HASSALL TRADING P/L 812 PARKES RD. FORBES NSW

EPA REGISTER LINK:

<https://wons.epa.nsw.gov.au/ordp0800>

EFFLUENT IRRIGATED POINT 1

LICENCE # 12765

REVISION: 0

Refer NEW POINTS FOR TESTING SITE PLAN AUG-18



DATE: 30/11/2018

PUBLISHED: 10/12/2018

RECORDS DONE DAILY BY WHO EVER
 IS IN CHARGE TO DO IRRIGATING.
 REFER IRRIGATION RECORD SHEETS
 KEPT IN OFFICE.

Lts	kilo/lts	No of days	low	kilo/lts	high	kilo/lts
556968	556.968	7	37390	37.39	151118	151.118
443571	443.571	7	33170	33.17	91101	91.101
559509	559.509	7	46207	46.207	120112	120.112
498825	499.825	7	48259	48.259	94267	94.267
55581	55.581	7	51048	51.048	127364	127.364
399350	399.35	7	44602	44.602	91951	91.951
616789	616.789	7	49838	49.838	123648	123.648
482007	482.007	7	51334	51.334	98252	98.252
482986	482.986	7	50586	50.586	107436	107.436
431007	431.007	7	40071	40.071	68330	68.33
422403	422.403	7	38666	38.666	81012	81.012
471633	471.633	7	42970	42.97	94169	94.169
553200	553.2	7	41404	41.404	150490	150.49
456301	456.301	7	41654	41.654	101579	101.579
518015	518.015	7	50953	50.953	114937	114.937
494533	494.533	7	58336	58.336	100001	100.001
620452	620.452	7	71236	71.236	111762	111.762
537987	537.987	7	51392	51.392	121463	121.463
607076	607.076	7	52338	52.338	139000	139
559026	559.026	7	72431	72.431	88707	88.707
553048	553.048	7	59821	59.821	96501	96.501
497127	497.127	7	70603	70.603	90896	90.896
521257	521.257	6	56397	56.397	164226	164.226
556931	556.931	7	60759	60.759	97951	97.951
568206	568.206	7	65273	65.273	93302	93.302
507009	507.009	7	17273	17.273	95415	95.415
539335	539.335	7	49301	49.301	93767	93.767
435307	435.307	7	45418	45.418	81815	81.815
589289	589.289	7	49693	49.693	109199	109.199
479878	479.878	7	42063	42.063	95473	95.473
404623	404.623	7	25700	25.7	75073	75.073
362223	362.223	7	38459	38.459	71988	71.988
272247	272.247	4	47266	47.266	84547	84.547
	0			0		0
	0			0		0
	0			0		0
	0			0		0
	0			0		0
	kilo/lts					
Total Lb	16,054,699	16,054.70	227			
No. times irrigated	227					
Avg: Lts	70725.5	70.73				

LH HASSALL TRADING P/L 812 PARKES RD. FORBES NSW



EPA REGISTER LINK:

<https://apps.epa.nsw.gov.au/drdoeoadp>
LICENCE # 12765

ANALYSIS & INTERPRETATION OF MONITORING RESULTS R1.8

DATE: 17/12/2017

PUBLISHED: 21-12-18

Effluent water, 2014 to 2018 with 2017 for comparison

Chloride levels in effluent water have trebled over the 4 year period although it is back a little (15%) on last year's (2017) high.

Sodium levels in effluent is up nearly 20% from 2014, but down 25% from 2017

Oil and grease levels in effluent water are down by two thirds since 2014, although this level had been achieved by 2017 with 2018 levels several times above last year's level

Average BOD in effluent is up 14% on 2014 but down about 25% on 2017

Nitrogen levels in effluent are up 60% on 2014 and up 4% on last year

Potassium levels are up 30% since 2014 but down just over 50% since last year

Phosphorus levels have risen 18% since 2014 but are down 32% on last year

Calcium and magnesium in effluent have only been monitored since 2017 and are down 40% and 500% respectively over the 12 month recording period.

Effluent conductivity readings have doubled since 2014 from ave 14.5ms/cm to 29.2ms/cm. Little change from 2017 (29.8ms/cm)

pH of effluent averages 11 in 2018, 10.5 in 2017 and 10 in 2014; a slightly rising alkalinity trend.

Soil test results; 2014 to 2018 with 2017 for comparison

14 tests are undertaken so a summary will be used, based on the comparative analysis provided by the consultancy eg. low, medium, high, extreme

pH. In 2014 'medium acidity' and 'slight acidity' were the dominant descriptive terms with one 'neutral'. By 2017 'medium' and 'slight acidity' were still the dominant terms (about equal numbers) but 3 'strongly acidic' descriptors were used. In 2018 there were only 3 'slight acidity' terms, while 'medium' and 'strong acidity' shared the remainder of the 14 tests.

Conductivity. In 2014 'Extreme' and 'Very High' descriptors shared the majority of EC terms with 'high' (1) the only other indicator. Salinity levels based on these same indicators in 2017 showed an equal spread across 'low', 'high', 'very high' and 'extreme' (3-4 descriptors each). The 2016 wet season has diluted salts and washed them to depth. By 2018 'Extreme' had become the majority indicator with 'high' & 'very high' making up most of the remainder.

Soil Nitrates in 2017 are up again (ave 75mg/kg over 14 tests) after the leaching of the very wet 2016 season. In 2017 nitrates averaged 27mg/kg whilst back in 2014 they averaged 68mg/kg over 14 sites.

The sodium absorption ratio also showed the impact of 2016 with 2017's average down. However over the 4 year period, the average of the sites increased 38% from ave 13.45 to 18.38. The impact of the extremely dry 2018 season is a causal factor too.

The individual elements and ions tend to jump around depending on recent irrigation and dryness. The tendency of an element like magnesium to translocate to depth is visible in 3 bays but not across the 7. Similar pattern in 2014. These bays had likely been recently irrigated. Magnesium and potassium levels have increased since 2014, over all samples, surface and depth. Magnesium by 20% and potassium by 48%. (See above for potassium in effluent)

As would be anticipated in soils showing rising acidity, hydrogen and aluminum levels are showing rises, although hydrogen has only recently added to the monitoring list.

Water to effluent: A 2012 figure is the baseline. Water usage to create an effluent stream has risen 25% (16 megalitres in 2018). This is down 11% on water usage last year.

Figures have remained reasonable steady over all years.

Discussion & Actions to be taken:

LH HASSALL TRADING P/L 812 PARKES RD. FORBES NSW



EPA REGISTER LINK:

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LICENCE # 12765

ANALYSIS & INTERPRETATION OF MONITORING RESULTS R1.8

DATE: 17/12/2017

PUBLISHED: 21-12-18

Increasing chloride, sodium and EC levels are concerns that have been addressed. Complete segregation of briney water from effluent, cleaning up fugitive salt spills and seeking out and sealing brine leaks are having effects with EC readings in the effluent line down by 50%. A target of 10 EC units is set in the short term with 3 EC units in the long term.

Extra water (under-used river allocation) will be added to the effluent stream in the short term to dilute salt in the stream and in the soil. Note: This t will see the effluent stream increase from 16 megs this year to 32 to 50 megs next year

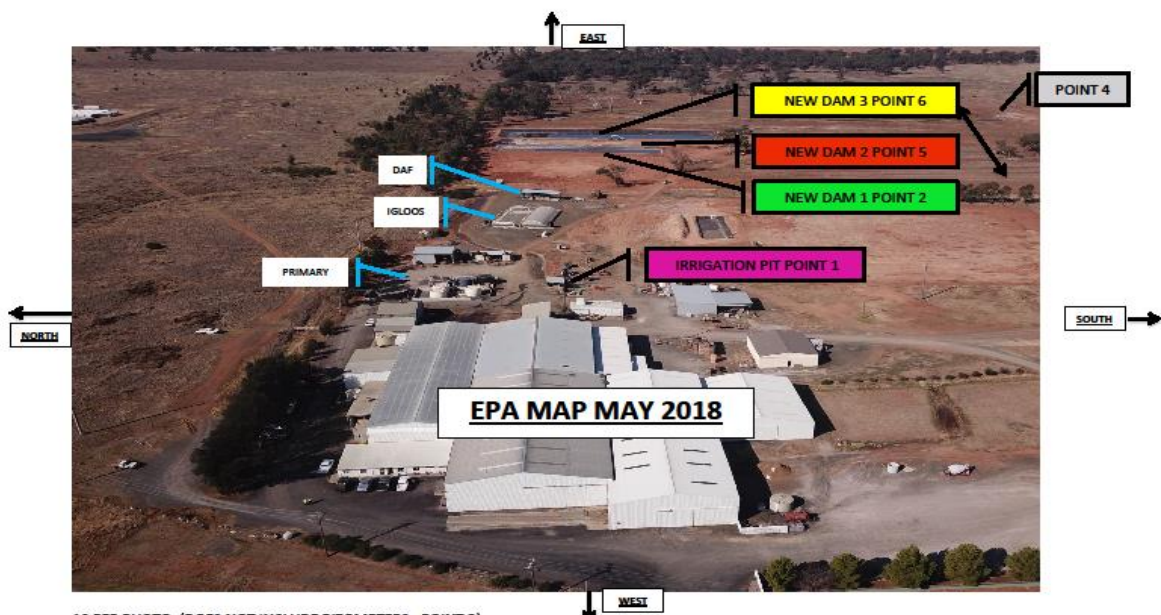
A recent in-depth analysis of soil salts records revealed the irrigation farm returned to 'normal', during the not so normal 2016 season. Then the 2018 drought escalated the salinity problem quickly. Readings back to 2008 showed salt levels were declining (from the highs set by the "millennial drought") indicating that the issue can be managed with the plans mentioned above.

Soil nitrate levels are concerning as they may translocate into groundwater. Re-establishment of permanent irrigation pasture is a medium term (6 month) goal to utilize this and the other nutrients which are high in proportions in effluent.

Soil and water pH are both higher than desired. Several processes involving alkaline materials (NaOH and lime) are being tested in the effluent stream, for other "tanning" processes. They will begin addressing acidity in the effluent stream and soil. 'Dosing' to add extra lime is an option close to implementation.

Fats and grease in the stream and Biological Oxygen Demand (BOD) are being addressed by mechanical means to set a downward trend. Drains from the factory have several screen traps to pick up flesh and fat. In 2019 a batching plant will be added to the effluent line to remove more organic matter.

As with nitrates, the "nutrient" elements will be utilized by a rejuvenated sward of pasture and crops to use and export these elements.



AS PER PHOTO: (DOES NOT INCLUDE PIZOMETERS= POINT 3)

- | | | | |
|----------|---------------------------------------|----------|-------------------------|
| #POINT 1 | IRRIGATION PIT | #POINT 2 | NEW DAM 1 |
| #POINT 3 | PIEZOMETERS x 6 = POINT 3 (NOT SHOWN) | #POINT 4 | IRRIGATION BLOCK = SOIL |
| #POINT 5 | NEW DAM 2 | #POINT 6 | NEW DAM 3 |

Council Lot Numbers

LORIS. H. HASSALLS TRADING - FORBES

APPENDIX: 1

