Amy Selvaraj (DELWP)

From: Andrew Helps

Sent: Sunday, 28 February 2021 4:28 PM

To: Amy Selvaraj (DELWP)

Subject: KALBAR Human Health Risk Assessment **Attachments:** 8330 Rev 34.pdf; Envirolab 22941-R01.pdf

EXTERNAL SENDER: Links and attachments may be unsafe.

Good Morning Amy,

I have been asked by a number of farmers at Lindenow to look at this document.

I am somewhat stunned that this document is actually in circulation as a supposedly credible human health risk document.

My concerns are as follows:

Table 9.7 page 82 of this document is providing data at mg/L level.

Global common practice (USEPA, China EPA, EU, UNEP, Japanese EPA, National Governments etc) is to test at ug/L level.

Why do we test at ug/L level?

Because the ICP MS machine tests to this level automatically!

AND many of the toxic metals in water and air can kill, injure or disable people at this level.

Why are KALBAR presenting data at mg/L level – probably because you present an uniformed public with a smaller number so therefore less scary.

I would love to see the spreadsheet that provided this mg/L data!

Perhaps your-self and Mr Wimbush need to talk to the Japanese about some of these toxic metals.

That is why there is a global toxic metal convention called the Minamata Convention and I am a delegated expert to this convention.

I find it interesting that KALBAR have not published the actual lab sheets!

My view is that there is something in KALBAR lab results that KALBAR do not want in the public domain.

Attached is a copy of my Rare Earth/Toxic element/Compound Calculation Template.

There are very serious problems with the Hazard Index numbers for:

Chromium -1 sample with a Hazard index of 30,798.

Gallium -3 samples with a Hazard Index ranging from 10,000 to 209,000.

Lanthanum - 3 samples with a Hazard Index ranging from 4101 to 111857.

Attached to this email is some testing results from a water sample at Lindenow taken by myself on the 13th of October last year. The samples were conveyed under a chain of custody to the lab in a refrigerated container

Envirolab (who I use as my Laboratory of choice for most of my work) Normally test for 40 metals for my work.

KALBAR have chosen to only put up data for 14 metals. What was really in the Envirolab Report for this testing for the other 26 metals?.

I have already put together the Radionuclide Slope Factor sheet for the Kalbar ore body – would you like a copy?

Actually, if a presume a level of intelligence and skills at KALBAR, they are probably worried about the number of RADNUCS in the ore body.

Amy could you please load down from the USA ATSDR website the following document: ATSDR Substance priority list full data.

You can then use this data to check some of the figures that you will get from KALBAR.
Please call me if you want to discuss this data.
Kindest regards
Andrew Helps
Mobile Mobile
UNEP Global Mercury Partnership
Waste Management Partnership - designated expert
Mercury added products and alternatives – designated expert

Mercury Fate and Transport Group

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UNEP Global Mercury Partnership

Partnership Areas: Mercury in Gold Mining, Mercury Supply and Storage, Mercury Air Transport and Fate, Mercury in Products.

KALBAR Resources Lindenow (Vic) Project

Author: Andrew Helps

DATA From Envirolab Analysis #22941 dated 16/10/2020

 $\ast \ast \ast \ast$ We need data on ecological tiping points

Conversion Factors

To Convert concentrations in air(at 25°C) from PPM to mg/m³ =

6/12/2020

(ppm) x (molecular weight of the compound) / (24.45) e.g for Antimony 1 ppm = 4.97 mg/m^3 .)

HI = +QTY Chemical TDD

	KALBAR Resource	s Linden	ow (Vic)	Project			(ppm) x (mo	lecular weight of the comp	oound) / (24.45)	e.g for Antimony 1	ppm = 4.97 mg/r	m ³ .)				Note*										
	Davo Farth /Toxi	c Elomoi	nt/Com	nound C	alculation T	Comple		Lindonow Too	tina on 1	2/10/2020									vestigation and			42/40/2020	12/10/2020	12/10/2020	12/10/2020	42/40/2020
	Rare Earth/Toxi File 8330 Revision 34	c Elemei	nt/Com		Rare Earths in Italia		ite	Lindenow Tes	ting on 1	3/10/2020		ATSDR &	ATSDR &	ATSDR &			PDRV - Prioriti	sed Dose Respor	ise value		13/10/2020 Water	13/10/2020 Water	13/10/2020 Sand	13/10/2020 Sand	13/10/2020 Sand	13/10/2020 Sand
	6th February 2021			,	tare Larais in Italie		нвтом*	Ignition	Solubility	ATSDR	Australia	USEPA	USEPA	USEPA	Australia	ATSDR SPL		CHRONIC IN	HALATION		L-25	L-28	L26	L27	L29	L30
	CHEMICAL	Specific		Formula	California	ATSDR	Ref	Temperature	in 100 parts	MRL's	Residential	Resident	Resident	Resident		THEORETICAL		Data Source		USEPA	ug/L	ug/L	mg/kg	mg/kg	mg/kg	mg/kg
	ELEMENTS/COMPOUNDS	6: Gravity		Weight (Molecular	Rated as	Rank	Pages	(Dust ⁰ C)	Cold Water	Chronic mg/kg/day	Soil mg/kg	Air	Tapwater mg/l	Tapwater	Tapwater	Daily Dose TDD (mg/day)	PDRV*		PDRV*	PDRV*						
	mg/kg - ug/kg			(Molecular Weight)	Carcinogen				Formular Dependent	mg/kg/day	(HIL A)	Carcinogenic Target Risk	mg/L	ug/L	ug/L	(Fit 70kg male)	Non Cancer		Cancer	Cancer						
									D= Dissolves		. ,	ug/m³				, ,				micrograms						
1	Aluminium (Al)	2.70 g/cm ³	Group 13	26.97	Carcinogen	183	549-560	650	i	1		0.52	2000	2000000		10.323	Neurological	ATSDR	0.2/3		12000	43000	13000	4700	28000	14000
2 3	Antimony (Sb) Arsenic (see note 1)	6.69 g/cm ³ 5.73 g/cm ³	Group 15 Group 15	121.76 299.64	Carcinogen Carcinogen	232	565-572 582-610	420 815	!	0.0003 0.0003	100	0.021 0.00065	0.78 0.052	780 52	10	0.103992 0.071278	0.2ug/m ³ 0.015ug/m ³	IRIS IARC 2B Cal IARC 1	0.2ug/m ³ 0.015ug/m ³	0.2 0.0043ug/m ³	<1	<1 4.00	<7 5.00	<7 <4	<7 8.00	<7 4.00
4	Boron	2.47 g/cm ³	Group 13	255.04	Carcinogen	•	302-010	013	·	0.0003	100	2.1	400	400000	10	0.0/12/6	0.01309/111	Cal IARC I	0.013ug/111	0.00 1349/111	30	60.00	<3	<3	15.00	<3
5	Arsine (gaseous AsH3)			77.93	Carcinogen	1	615	285	20cc			0.005	0.007	7			0.05 ug/m ³	IARC 1	0.0043ug/m ³	0.0043	50	00.00	?	?	?	?
6	Barium	3.51 g/cm ³	Group 2	137.36	_	134	625-633	725	D	0.2		0.00108	0.51499	514.99		0.61652					37.00	150.00	18	15.0	58.0	22.0
7	Beryllium (glucinum)	1.85 g/cm ³	Group 4	9.02	Carcinogen	43	636-651	1278	i	0.002	60	0.00000	2.50	2500	60.0	0.0078	0.01 ug/m ³	IRIS IARC 1	0.0024ug/m ³	0.0024	<0.5	3.00	<1	<1	<1	<1
8	Bismuth (Bi)	9.72 g/cm ³	Group 4	209.00			655-663	271.3	i												<1	<1	<1	<1	<1	<1
9	Cadmium (Cd)	8.65 g/cm ³	Group 12	112.41	Carcinogen	7	668-708	1040	i	0.0005	20	0.00001	0.92	920	2	0.045127	0.01 ug/m3	ATSDR	0.0018ug/m ³	0.0018	<0.2	<0.2	<0.4	<0.4	<0.8	<0.4
11	Ceric Oxide (Cerium)Ce0 ₂ Chromium compounds (Cr)	6.71 g/cm ³	Group 3 Group 6	172.13 52.01	Suspected Carcinogen	570 66	101-102 717-739	3500 580	!	1 mSv/yr 0.0009		0.094 0.00001				0.00263					14.00 11	66.00 48				
	Cobalt (Co)	8.85 g/cm ³	Group 9	58.94	Carcinogen	52	743-759	760	;	1 mSv/yr	100	0.00001	0.6	600		0.67523	0.1 ug/m ³	ATSDR			1.0	6.00	2.00	1.00	8.00	3
	Caesium	g/	Group 3	30.31	curcinogen	32	743 733	700	•	111134/41	100	0.000031	0.0	000		0.07323		ATSOR			<1	2.00	1.00	1.00	1.00	1.00
16		8.94 g/m ³	Group 11	63.57		125	765-782	900	i	0.01	6000		80	80000	2000	0.47242					<2	5.00	<1	<1	570	<1
17	Dysprosium Dy20 ₃	8.53 g/m ³	Group 3	162.5	Suspected			2567	i																	
18	Erbium Er20 ₃	9.04 g/m ³	Group 12	167.26	Suspected			1529	i																	
19 20	, -	5.25 g/cm ³ 7.87 g/cm ³	Group 3 Group 3	151.96 157.25	Suspected	575		1800 3545	i :																	
21	, ,	5.91 g/cm ³	Group 3 Group 13	69.72	Suspected Carcinogen		787-797	3545 29.78	'			0.00001				0.00011							4.00	2	13	6.00
22		5.32 g/cm ³	Group 14	72.63	ca. c.nogen		800-813	25.70	i			0.00001				0.00011								-		0.00
23		8.80 g/m ³	Group 12	164.93	Suspected			1474	i																	
24	Iron	7.87 g/cm ³	Group 8	55.85			878-902	420	i			0.01626	11.29	11290		18.07					8100.00	30000.00	30000	12000	37000	26000
25		6.17 g/m ³	Group 3	138.92	Suspected	711	903-908	920	i			0.00018	0.00268	2.68	2.68	0.02188					9.00	43.00	16	9	27	15
26	Lead - not 210 (Pb)	11.34 g/cm ³		430.42	Carcinogen	2	129-131	710	i 	0.404404	300		15	15000	10	0.330938	0.15 ug/m ³	OAQPS			6	30.0	10	4	29	11
27 28	Lithium Oxide Li ₂ O Lutetium -176	0.53 g/cm ³ 9.84 g/cm ³	Group 1 Group 3	29.88 174.99	Suspected Suspected	335	969-974	2600 1936	to LiOH	0.404424			0.3835	383.5		0.404424		ATSDR			3.00	15.00	4	1	11	5
29		3.58 g/cm ³	Group 2	24.32	Suspecteu			520	;			0.0907	33.3369	33336.9		35.96134										
30	Manganese	7.47 g/cm ³	Group 6	54.93		140	975-1005		D	0.3 ug/m3	3800	0.05	43	43000	500	1.61855	0.03 ug/m ³	ATSDR			120	93	33	10	190	31
31		13.55 g/cm ³		200.61	Suspected	3	1014-1064	0 -	i	0.0002 mg/m3	40		0.063	63	1	0.051981	0.3ug/m ³	IRIS			< 0.05	<0.05	<0.1	< 0.1	<0.1	<0.1
32	Methyl Mercury	215.63g/mo		417.22	Suspected	120	448-450	within organics	i	0.0003			0.2	200			0.1 ug/m ³	IRIS	0.1 ug/m ³	0.1						
33	•	10.22 g/cm ³	-	95.95		326	1077-1107		i	0.00004 mg/m ³			10	10000	50	0.2412	0.2ug/m ³	IARC 2B			<1	<1	<1	<1	<1	<1
34		8.90 g/cm ³ 7.00 g/cm ³	Group 10	58.69	Carcinogen	57	1091-1107		i	0.00009 mg/m ³	400		20	20000	20	0.38969	0.09 ug/m ³	ATSDR/CAL	0.00024 ug/m ³	0.00024	4	12.0	4.0	1	15	4
35 36	Neodymium 144 Palladium	12.99 g/cm ³	Group 3 Group 10	144.27 106.7	Suspected Suspected	173	1113-1121	1021 2963	D i			0.012000				0.00018					2.70	2.40				
37	Platinum			195.23	Suspecteu	1/3	1125-1138		i			0.012000				0.00010										
38	Praseodymium Pro 6	6.78 g/cm ³	Group 3	140.92	Suspected			3512	D																	
39	Radium 222, 226 or 228	5.5 g/cm ³	Group 2	226.05	Carcinogen			1500	i			5pCi total o	combined per lit	tre of water												
40	Radium Bromide	5.79 g/cm ³	Group 2	385.88																						
41 42		8.85 g/cm ³ 1.63 g/cm ³	Group 9	102.91 85.48	Sugmented	711	1143-1171		i			0.00001				0.000091					0.00	21.00				
43	Samarium 147 (Chloride)	7.54 g/cm ³	Group1 Group 3	150.43	Suspected Suspected	711			NK :	EPA Doc EPA/690/R	-09/050F	0.00001				0.00091					8.00	31.00				
44	Scandium Sc20 3	2.99 g/cm ³	Group 3	45.1	Suspected	584			NK	I A DOC LI AJ OSOJIK	03/0301										<1	8.00				
45	-	4.50 g/cm ³	Group 16	631.68	Suspected	146	1176-1203	950+	i	0.005 mh/kg/day	200	0.00002	0.03657	36.57	10	0.03778	20 ug/m ³	CAL			<1	5.00	<2	<2	<2	<2
	Silica PM _{2.5} Faction)	2.33 g/cm ³	Group 14	60.06	Carcinogen		102	780	i				0.31000	310		Annual av										
47	,	2.067 g/cm ³	-	32.06				392	i			0.00122		0.21		0.01829							_	_		
48 49	Strontium SrO (Stable)	2.64 g/cm ³ 6.24 g/cm ³		87.63	Carcinogen		455	768.85	D :	2 mg/kg/day		0.00003				0.00039					28 <0.5	69 <0.5	5 <1	2 <1	31	4
49	Tellurium Terbium Tb40 ₇	_		127.61 159.2	Carcinogen Suspected		1218-1226	449.51 1356	ı NK			0.00003				0.00039					<0.5	<0.5	<1	<1	<1	<1
	Thallium	11.86 g/cm ³		204.39	Suspected	279	1229-1238		i			0.00007	0.01355			0.01579					<1	<1	<2	<2	<2	<2
	Thorium 229	11.73 g/cm ³		232.12	Carcinogen	227		270	i									IARC I	$0.000185 \; pCi/m^3$		1.0	5.0	6	3	5	6
54	Thulium Tm2O3	9.33 g/cm ³	Group 12	169.4	Suspected			1950	i								_									
	Titanium	4.54 g/cm ³		47.9	Carcinogen		1287-1294		i	0.0001 mg/m3			0.021			2.271688	0.01 ug/m ³	ATSDR	Respiratory		110	76				
	Tin	_		118.7		307	1242-1276		i	0.3 mg/kg/day			1200		1200	0.09981					2.0	<1				
57 58	Tungsten	19.25 g/cm ³ 19.05 g/cm ³		183.92 238.07	Carringson	07	1297-1305		:	0.00004 ma/m2											<1 0.6	<1 3.5	_1	_1	2	1
	Uranium 234 Vanadium (86%)	6.10 g/cm ³		50.95	Carcinogen Carcinogen	97 200	1308-1338 1348-1364		i	0.00004 mg/m3 0.0001 mg/m3			8.6			0.123043		CAL		0.00034	13	53	<1 50	<1 28	62	1 54
60		6.95 g/cm ³	-	173.04	Suspected	581		555	NK				0.0									33	50			٥.
	Yttrium Y2O 3	4.47 g/cm ³	Group 3	88.92	Suspected	711			D			0.0000006				0.000118					6.70	33.00	7.60	4.8	15	7.8
	Zinc	7.14 g/cm ³	Group 12	65.38		75	1369-1382	600	i	0.3 mg/kg/day	7400		600			1.96084					9	25.0	4	1	280	3
	Zirconium	6.51 g/cm ³	Group 4	91.22	Carcinogen	701		20	i				0.16		0.000022	0.00032										
	Hydrogen Cyanide	0.69g/cm ³		179.16	Reproductive	35			NK Destists	TODAC A- 1 :	250		0.15		80	1.3058										
	PM10 PM2.5				Carcinogen					ICPMS Analysis ICPMS Analysis						24 hour av	Annual Average									
67	1114.3				Carcillogeil				railitie	TOI 1-10 MIRRINGS						AT HOUL DV	Amuai Aveidyt	-								
	Radionuclides (Uranium)	18.7 g/cm ³	Group 3	238.03	Carcinogen	102	1307-1345	i	i										0.000185 pCi/m ³							
	•																									



Envirolab Services Pty Ltd

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CERTIFICATE OF ANALYSIS 22941

Client Details	
Client	Andrew Helps
Attention	Andrew Helps
Address	VIC

Sample Details	
Your Reference	F01-11 Lindenow
Number of Samples	2 Water, 3 Sand, 1 Sludge
Date samples received	14/10/2020
Date completed instructions received	14/10/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details				
Date results requested by	16/10/2020			
Date of Issue	20/10/2020			
Reissue Details	This report supersedes 22941_R00 due to addition of Sulphur on all samples.			
NATA Accreditation Number 2901. This document shall not be reproduced except in full.				
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *				

Results Approved By

Chris De Luca, Operations Manager

Authorised By

Pamela Adams, Laboratory Manager



Acid Extractable metals in soil					
Our Reference		22941-2	22941-3	22941-5	22941-6
Your Reference	UNITS	L-26	L-27	L-29	L-30
Date Sampled		13/10/2020	13/10/2020	13/10/2020	13/10/2020
Type of sample		Sand	Sand	Sludge	Sand
Date digested	-	14/10/2020	14/10/2020	14/10/2020	14/10/2020
Date analysed	-	15/10/2020	15/10/2020	15/10/2020	15/10/2020
Silver	mg/kg	<1	<1	<1	<1
Aluminium	mg/kg	13,000	4,700	28,000	14,000
Antimony	mg/kg	<7	<7	<7	<7
Arsenic	mg/kg	5	<4	8	4
Boron	mg/kg	<3	<3	15	<3
Barium	mg/kg	18	15	58	22
Beryllium	mg/kg	<1	<1	<1	<1
Bismuth	mg/kg	<1	<1	<1	<1
Cadmium	mg/kg	<0.4	<0.4	<0.8	<0.4
Cobalt	mg/kg	2	1	8	3
Chromium	mg/kg	19	8	34	20
Copper	mg/kg	<1	<1	570	<1
Caesium*	mg/kg	<1	<1	<1	<1
Gallium	mg/kg	4	2	13	6
Gold*	mg/kg	<1	<1	<1	<1
Iron	mg/kg	30,000	12,000	37,000	26,000
Lanthanum*	mg/kg	16	9	27	15
Lead	mg/kg	10	4	29	11
Lithium	mg/kg	4	1	11	5
Manganese	mg/kg	33	10	190	31
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Molybdenum	mg/kg	<1	<1	<1	<1
Nickel	mg/kg	4	1	15	4
Selenium	mg/kg	<2	<2	<2	<2
Strontium	mg/kg	5	2	31	4
Sulphur	mg/kg	150	31	5,700	160
Tellurium	mg/kg	<1	<1	<1	<1
Thallium	mg/kg	<2	<2	<2	<2
Tin	mg/kg	<1	<1	2	<1
Titanium	mg/kg	7	9	61	6
Thorium	mg/kg	6	3	5	6
Uranium	mg/kg	<1	<1	2	1
Vanadium	mg/kg	50	28	62	54
Yttrium*	mg/kg	7.6	4.8	15	7.8

Acid Extractable metals in soil						
Our Reference		22941-2	22941-3	22941-5	22941-6	
Your Reference	UNITS	L-26	L-27	L-29	L-30	
Date Sampled		13/10/2020	13/10/2020	13/10/2020	13/10/2020	
Type of sample		Sand	Sand	Sludge	Sand	
Zinc	mg/kg	4	1	280	3	

Moisture					
Our Reference		22941-2	22941-3	22941-5	22941-6
Your Reference	UNITS	L-26	L-27	L-29	L-30
Date Sampled		13/10/2020	13/10/2020	13/10/2020	13/10/2020
Type of sample		Sand	Sand	Sludge	Sand
Date prepared	-	14/10/2020	14/10/2020	14/10/2020	14/10/2020
Date analysed	-	15/10/2020	15/10/2020	15/10/2020	15/10/2020
Moisture	%	2.9	14	88	7.3

All metals in water - total			
Our Reference		22941-1	22941-4
Your Reference	UNITS	L-25	L-28
Date Sampled		13/10/2020	13/10/2020
Type of sample		Water	Water
Date prepared	-	14/10/2020	14/10/2020
Date analysed	-	14/10/2020	14/10/2020
Silver-Total	μg/L	<1	<1
Aluminium-Total	μg/L	12,000	43,000
Arsenic-Total	μg/L	3	4
Boron-Total	μg/L	30	60
Barium-Total	μg/L	37	150
Beryllium-Total	μg/L	<0.5	3
Bismuth-Total	μg/L	<1	<1
Cadmium-Total	μg/L	<0.2	<0.2
Cerium-Total*	μg/L	14	66
Cobalt-Total	μg/L	1	6
Chromium-Total	μg/L	11	48
Copper-Total	μg/L	<2	5
Caesium-Total*	μg/L	<1	2
Gallium-Total	μg/L	3	15
Mercury-Total	μg/L	<0.05	<0.05
Iron-Total	μg/L	8,100	30,000
Lanthanum-Total	μg/L	9	43
Lithium-Total	μg/L	3	15
Manganese-Total	μg/L	120	93
Molybdenum-Total	μg/L	<1	<1
Niobium-Total*	μg/L	2.7	2.4
Nickel-Total	μg/L	4	12
Lead-Total	μg/L	6	30
Rubidium-Total*	μg/L	8	31
Rhenium-Total*	μg/L	<1	<1
Antimony-Total	μg/L	<1	<1
Scandium-Total*	μg/L	<1	8
Selenium-Total	μg/L	<1	2
Tin-Total	μg/L	2	<1
Strontium-Total	μg/L	28	69
Tantalum-Total*	μg/L	<1	<1
Tellurium-Total*	μg/L	<0.5	<0.5
Thorium-Total	μg/L	1	5.0
Thallium-Total	μg/L	<1	<1

All metals in water - total			
Our Reference		22941-1	22941-4
Your Reference	UNITS	L-25	L-28
Date Sampled		13/10/2020	13/10/2020
Type of sample		Water	Water
Titanium-Total	μg/L	110	76
Uranium-Total	μg/L	0.6	3.5
Vanadium-Total	μg/L	13	53
Tungsten-Total	μg/L	<1	<1
Yttrium-Total*	μg/L	6.7	33
Zinc-Total	μg/L	9	25

Metals in Waters - Total			
Our Reference		22941-1	22941-4
Your Reference	UNITS	L-25	L-28
Date Sampled		13/10/2020	13/10/2020
Type of sample		Water	Water
Date prepared	-	20/10/2020	20/10/2020
Date analysed	-	20/10/2020	20/10/2020
Sulfur -Total	mg/L	2.0	3.6

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 12 hours.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.

QUALITY CONT	ΓROL: Acid E	xtractabl	e metals in soil			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date digested	-			14/10/2020	3	14/10/2020	14/10/2020		14/10/2020	
Date analysed	-			15/10/2020	3	15/10/2020	15/10/2020		15/10/2020	
Silver	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	98	
Aluminium	mg/kg	10	Metals-020 ICP- AES	<10	3	4700	3600	27	98	
Antimony	mg/kg	7	Metals-020 ICP- AES	<7	3	<7	<7	0	102	
Arsenic	mg/kg	4	Metals-020 ICP- AES	<4	3	<4	<4	0	108	
Boron	mg/kg	3	Metals-020 ICP- AES	<3	3	<3	<3	0	89	
Barium	mg/kg	1	Metals-020 ICP- AES	<1	3	15	11	31	104	
Beryllium	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	109	
Bismuth	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	91	
Cadmium	mg/kg	0.4	Metals-020 ICP- AES	<0.4	3	<0.4	<0.4	0	104	
Cobalt	mg/kg	1	Metals-020 ICP- AES	<1	3	1	1	0	103	
Chromium	mg/kg	1	Metals-020 ICP- AES	<1	3	8	7	13	103	
Соррег	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	101	
Caesium*	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	100	
Gallium	mg/kg	1	Metals-020 ICP- AES	<1	3	2	2	0	115	
Gold*	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	99	
Iron	mg/kg	10	Metals-020 ICP- AES	<10	3	12000	13000	8	99	
Lanthanum*	mg/kg	1	Metals-020 ICP- AES	<1	3	9	8	12	111	
Lead	mg/kg	1	Metals-020 ICP- AES	<1	3	4	4	0	98	
Lithium	mg/kg	1	Metals-020 ICP- AES	<1	3	1	1	0	90	[NT]

QUALITY CON	ITROL: Acid E	xtractab	le metals in soil			Du		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Manganese	mg/kg	1	Metals-020 ICP- AES	<1	3	10	12	18	105	[NT]
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	3	<0.1	<0.1	0	110	[NT]
Molybdenum	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	100	[NT]
Nickel	mg/kg	1	Metals-020 ICP- AES	<1	3	1	1	0	99	[NT]
Selenium	mg/kg	2	Metals-020 ICP- AES	<2	3	<2	<2	0	100	[NT]
Strontium	mg/kg	1	Metals-020 ICP- AES	<1	3	2	2	0	107	[NT]
Sulphur	mg/kg	10	Metals-020 ICP- AES	<10	3	31	33	6	105	[NT]
Tellurium	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	98	[NT]
Thallium	mg/kg	2	Metals-020 ICP- AES	<2	3	<2	<2	0	97	[NT]
Tin	mg/kg	1	Metals-020 ICP- AES	<1	3	<1	<1	0	99	[NT]
Titanium	mg/kg	1	Metals-020 ICP- AES	<1	3	9	9	0	108	[NT]
Thorium	mg/kg	2	Metals-022 ICP-MS	<2	3	3	2	40	106	[NT]
Uranium	mg/kg	1	Metals-022 ICP-MS	<1	3	<1	<1	0	107	[NT]
Vanadium	mg/kg	1	Metals-020 ICP- AES	<1	3	28	31	10	102	[NT]
Yttrium*	mg/kg	1	Metals-020 ICP- AES	<1	3	4.8	4.5	6	98	[NT]
Zinc	mg/kg	1	Metals-020 ICP- AES	<1	3	1	<1	0	102	[NT]

QUALITY CO	NTROL: All	metals in	water - total			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			16/10/2020	[NT]		[NT]	[NT]	16/10/2020	
Date analysed	-			16/10/2020	[NT]		[NT]	[NT]	16/10/2020	
Silver-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	105	
Aluminium-Total	μg/L	10	Metals-022 ICP-MS	<10	[NT]		[NT]	[NT]	106	
Arsenic-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	105	
Boron-Total	μg/L	20	Metals-022 ICP-MS	<20	[NT]		[NT]	[NT]	107	
Barium-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	106	
Beryllium-Total	μg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]		[NT]	[NT]	103	
Bismuth-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	119	
Cadmium-Total	μg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]		[NT]	[NT]	105	
Cerium-Total*	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	102	
Cobalt-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	105	
Chromium-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	102	
Copper-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	106	
Caesium-Total*	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	104	
Gallium-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	103	
Mercury-Total	μg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]		[NT]	[NT]	85	
Iron-Total	μg/L	10	Metals-022 ICP-MS	<10	[NT]		[NT]	[NT]	103	
Lanthanum-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	101	
Lithium-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	105	
Manganese-Total	μg/L	5	Metals-022 ICP-MS	<5	[NT]		[NT]	[NT]	105	

QUALITY C	ONTROL: All	metals ir	ı water - total			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Molybdenum-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	104	[NT]
Niobium-Total*	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	111	[NT]
Nickel-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	104	[NT]
Lead-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	104	[NT]
Rubidium-Total*	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	105	[NT]
Rhenium-Total*	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	108	[NT]
Antimony-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	110	[NT]
Scandium-Total*	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	108	[NT]
Selenium-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	104	[NT]
Tin-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	106	[NT]
Strontium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	103	[NT]
Tantalum-Total*	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	102	[NT]
Tellurium-Total*	μg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]		[NT]	[NT]	102	[NT]
Thorium-Total	μg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]		[NT]	[NT]	95	[NT]
Thallium-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	104	[NT]
Titanium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	103	[NT]
Uranium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]		[NT]	[NT]	101	[NT]
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	102	[NT]
Tungsten-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	107	[NT]
Yttrium-Total*	μg/L	1	Metals-022 ICP-MS	<1	[NT]		[NT]	[NT]	101	[NT]

QUALITY CO		Duj		Spike Recovery %						
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Zinc-Total	μg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]		[NT]	106	[NT]

QUALITY CC	Duplicate				Spike Recovery %					
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			20/10/2020	[NT]		[NT]	[NT]	20/10/2020	
Date analysed	-			20/10/2020	[NT]		[NT]	[NT]	20/10/2020	
Sulfur -Total	mg/L	0.5	Metals-020 ICP- AES	<0.5	[NT]		[NT]	[NT]	110	

Result Definiti	ons
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control	ol Definitions
Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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Report Comments

METALS: The PQL has been raised for Cadmium & Copper due to the sample matrix requiring dilution.

PQL has been raised for Cadmium due to the high moisture content in the sample, resulting in a high dilution factor.

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