

Tarago Station
C/-
Goulburn Street
Tarago NSW 2580

Delivered: by email

Tarago Railway Station, Goulburn Street, Tarago NSW Lead Investigation Report

Date 12/10/2020

This report presents the findings of an investigation of lead at Tarago Railway Station undertaken as part of the investigation of lead impacts in the Tarago Community.

Investigation at the Tarago Railway Station site comprised collection of samples as shown **Table 1** in the attached figure. Samples were collected on 19 December 2019 from the station platform and carpark and on 25 March 2020 from inside station buildings. Additional samples were collected on 11 August 2020 of surficial soil from the station carpark and paint from the exterior of station buildings.

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Table 1 Samples Collected

Type	Number of samples collected
Soil	25
External dust	5
Internal dust	5
Paint	5

Sample locations are presented on a site features plan presented as **Attachment 1**. Samples were sent to an independent certified laboratory for analysis.

Results

Sample results were compared against guidelines relevant for commercial/ industrial land use. Results are tabulated in **Table 2**. Concentrations shown in BOLD are above the relevant guideline.

Table 2 Summary lead concentrations relevant to health investigation levels

Type	Guideline	Result				
Soil	1500 (mg/kg) ¹	SS55 1800	SS69 580	SS70 150	SS71 1200	SS72 480
		TS_SS01 110	TS_SS02 550	TS_SS03 510	TS_SS04 710	TS_SS05 560
		TS_SS06 885 ⁶	TS_SS07 2,000	TS_SS08 2,400	TS_SS09 670	TS_SS10 510
		TS_SS11 170	TS_SS12 320	TS_SS13 420	TS_SS14 360	TS_SS15 1,000
		TS_SS16 900	TS_SS17 300	TS_SS18 750 ⁶	TS_SS19 720	TS_SS20 920
External Dust	4,300 (µg/m ²) ²	SWAB1 770	SWAB2 278	SWAB3 1667	SWAB4 2875	SWAB5 1875
Internal Dust – Floors	1,000 (µg/m ²) ³	DSWAB_SE_FE (TS) 3,333		DSWAB_SE (TS) 14,444	DSWAB_FE (TS) 14,444	
Internal Dust – Window Sills and Shelves	5,000 (µg/m ²) ³	DSWAB_FP (TS) 8,556				
Bulk Internal Dust	NA (mg/kg)	DVAC_CR(TS) 1100				
Paint	0.1% ⁷	TS_PAINT_1 4.1	TS_PAINT_2 4.4	TS_PAINT_3 0.04	TS_PAINT_4 11	TS_PAINT_5 <0.01

¹ NEPM (2013) Schedule B1: Guideline on investigation levels for soil and groundwater. National Environment Protection (Assessment of Site Contamination) Measure 1999. Federal Register of Legislative Instruments F2013C00288 (HIL D – Commercial / Industrial).

² NSW EPA (2003) Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices. A Guide for Councils. NSW Environment Protection Authority.

³ AS 4361.2-1998 Guide to lead paint management - Residential and commercial buildings.

⁴ The dust results presented are lead loadings (µg lead/m²). For vacuum samples, lead loadings were calculated as follows:

Lead loading (µg/m²) = (lead concentration (mg/kg) x dust sample mass (kg) / sample area (m²)) x 1000 (to convert from µg to mg).

For swab samples, lead loadings were calculated as follows:

Lead loading (µg/m²) = Total lead (µg) / sample area (m²).

⁵ DVAC_CR(TS) was collected as a bulk dust sample from an unquantified areas within the main station building (floor space). Lead concentrations in internal dust (mg/kg) have not been directly compared to an assessment criteria and were collected to inform assessment of site specific risk assessment (if required).

⁶ The higher lead concentration reported in the duplicate sample was adopted as a conservative approach.

⁷ Australian Government Department of the Environment, Lead Alert: the six step guide to painting your home, 5th Ed. 2016. The adopted criteria (0.1 % w/w) is not indicative of human health risk but rather is indicative of lead based paint.

Laboratory reports are presented as **Attachment 2**. **Table 2** presents a comparison of the results against the guidelines values. Key findings were:

1. Lead concentrations in soil fall below the adopted guideline with the exception of SS55, TS_SS07 and TS_SS08. Guidance endorsed by the NSW EPA makes provision for contaminant risks to be assessed through calculation of the 95% upper confidence limit (95% UCL) of the mean concentration. The 95% UCL is a value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95 percent of the time. The 95% UCL is only relevant where:

- a. the standard deviation of the results should be less than 50% of the relevant investigation or screening level, and
- b. no single value should exceed 250% of the relevant investigation or screening level.

The maximum lead concentration in surficial soils (i.e.: those collected from 0-0.05m below ground level) was 2,400 mg/kg (< 250% of the guideline) and the standard deviation in surficial soils was 570 mg/kg (< 50% of the guideline). The 95% UCL was therefore considered relevant and was calculated at 1000 mg/kg and below the adopted guideline and risks from lead in soil are considered low and acceptable.

The 95% UCL calculations are presented as **Attachment 3**.

2. Lead loadings in external dust (on the station platform) were reported below the adopted guideline value. Risks from lead in external dust on the Station platform are considered to be low and acceptable.
3. Lead loadings in internal dust were reported above adopted guideline values in four samples. The degree of exceedance (> 14 times the guideline in two instances) is sufficient to indicate a potential risk is likely to exist where station workers are exposed to internal dust.
4. Lead exceeded the 0.1% indicative of lead based paint in three of five paint samples collected. Lead paint should be managed in accordance with AS 4361.2-1998 Guide to lead paint management – Residential and commercial buildings.

For further information please contact the undersigned.

Yours sincerely



Stephen Maxwell

Tarago Lead Investigation Project Manager

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Attachments

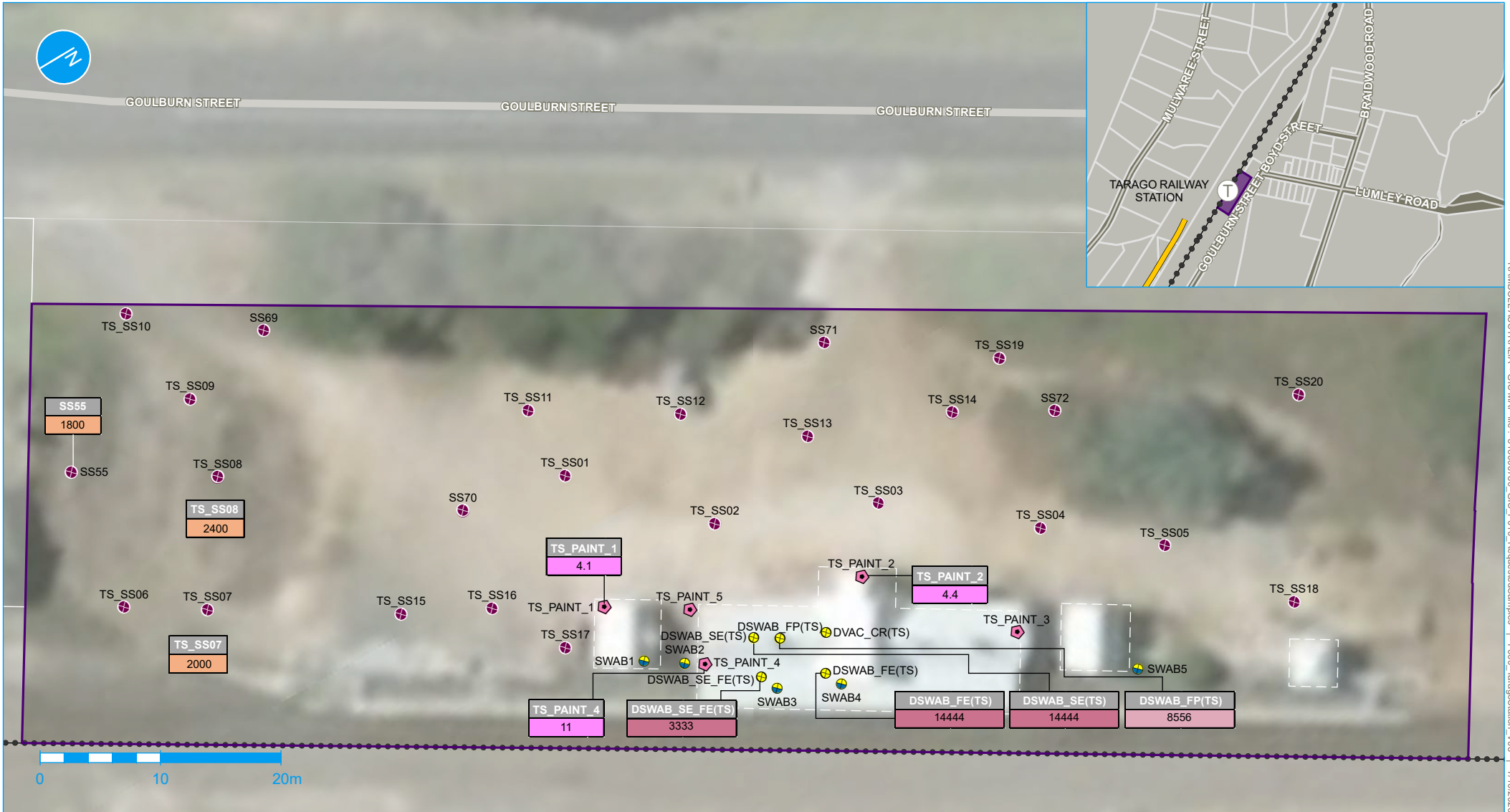
1. Figure of sampling locations
2. Laboratory reports¹
3. 95% UCL calculations

Limitations

Ramboll Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to John Holland Rail and in accordance with our understanding and interpretation of current regulatory standards. A representative program of sampling and laboratory analyses was undertaken as part of this investigation. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous. Site conditions may change over time. This report is based on conditions encountered at the Site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time. The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment. Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate. This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

¹ Laboratory report 694957 contains results from sampling at Tarago train station and sampling in other areas of Tarago.

Attachment 1: Site Features Plan



RAMBOLL AUSTRALIA - GIS MAP file : 318000780_GIS_P010_RequestedSamples | F000_TaragoStation_V03 | 7/10/2020

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Site boundary
- ⬠ Paint sample
- ⊗ Soil sample
- ⊗ Internal dust swab
- ⊗ External dust swab

Lead exceedance criteria

Soil	Dust Interior	Paint
>1500 (mg/kg)	Floors >1000(µg/m ²)	>0.1%
	Window Sills / Shelves >5000 (µg/m ²)	



While every effort has been made to ensure that the information contained in this document is correct and current, Ramboll Australia does not warrant the accuracy, quality, reliability or completeness of the property boundary or imagery information. Ramboll Australia accepts no liability for any loss, damage, cost or expense incurred whether by reason of negligence or otherwise arising from any use of the information provided.

Ramboll – Tarago Train Station, Goulburn Street

Attachment 2: Laboratory Reports

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 North Sydney
 NSW 2060



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Attention: **Stephen Maxwell**

Report **694957-A**
 Project name **318000780**
 Received Date **Dec 20, 2019**

Client Sample ID			SWAB1	SWAB2	SWAB3	SWAB4
Sample Matrix			Wipes	Wipes	Wipes	Wipes
Eurofins Sample No.			S19-De30566	S19-De30567	S19-De30568	S19-De30569
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	52	25	150	230

Client Sample ID			SWAB5	SWAB6	SWAB7	SWAB8
Sample Matrix			Wipes	Wipes	Wipes	Wipes
Eurofins Sample No.			S19-De30570	S19-De30571	S19-De30572	S19-De30573
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	150	13	24	110

Client Sample ID			SWAB9	SWAB10	SWAB11	SWAB12
Sample Matrix			Wipes	Wipes	Wipes	Wipes
Eurofins Sample No.			S19-De30574	S19-De30575	S19-De30576	S19-De30577
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	29	70	4.0	3.7

Client Sample ID			SWAB13	SWAB14	SWAB15	SWAB16
Sample Matrix			Wipes	Wipes	Wipes	Wipes
Eurofins Sample No.			S19-De30578	S19-De30579	S19-De30580	S19-De30581
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	3.3	2.8	1.1	1200

Client Sample ID			SWAB17	SWAB18	SWAB19	SWAB20
Sample Matrix			Wipes	Wipes	Wipes	Wipes
Eurofins Sample No.			S19-De30582	S19-De30583	S19-De30584	S19-De30585
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	410	900	750	1600

Client Sample ID			SWAB21	QA1	QA2
Sample Matrix			Wipes	Wipes	Wipes
Eurofins Sample No.			S19-De30586	S19-De30598	S19-De30599
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit			
Heavy Metals					
Lead	1	Total ug	47	< 1	1.2

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Attention: **Stephen Maxwell**

Report **694957-S**
 Project name **318000780**
 Received Date **Dec 20, 2019**

Client Sample ID			HA01_0.1	HA01_0.25	HA01_0.5	HA01_0.75
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30523	S19-De30524	S19-De30525	S19-De30526
Date Sampled			Dec 18, 2019	Dec 18, 2019	Dec 18, 2019	Dec 18, 2019
Test/Reference	LOR	Unit				
<hr/>						
% Moisture	1	%	2.2	7.0	18	17
Heavy Metals						
Lead	5	mg/kg	720	820	29	55

Client Sample ID			HA01_1.0	HA02_0.1	HA02_0.25	HA02_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30527	S19-De30528	S19-De30529	S19-De30530
Date Sampled			Dec 18, 2019	Dec 18, 2019	Dec 18, 2019	Dec 18, 2019
Test/Reference	LOR	Unit				
<hr/>						
% Moisture	1	%	15	2.3	13	10
Heavy Metals						
Lead	5	mg/kg	34	450	12	7.4

Client Sample ID			HA02_0.75	HA02_1.0	HA03_0.1	HA03_0.25
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30531	S19-De30532	S19-De30533	S19-De30534
Date Sampled			Dec 18, 2019	Dec 18, 2019	Dec 18, 2019	Dec 18, 2019
Test/Reference	LOR	Unit				
<hr/>						
% Moisture	1	%	14	13	4.2	8.0
Heavy Metals						
Lead	5	mg/kg	11	11	2100	1600

Client Sample ID			HA03_0.5	HA03_0.75	SS113	SS114
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30535	S19-De30536	S19-De30537	S19-De30538
Date Sampled			Dec 18, 2019	Dec 18, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	11	12	3.5	2.2
Heavy Metals						
Lead	5	mg/kg	210	460	300	360

Client Sample ID			SS115	SS116	SS117	SS118
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30539	S19-De30540	S19-De30541	S19-De30542
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	3.4	< 1	3.1	2.3
Heavy Metals						
Lead	5	mg/kg	220	250	250	880

Client Sample ID			SS119	SS120	SS121	SS122
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30543	S19-De30544	S19-De30545	S19-De30546
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	3.4	3.0	1.1	2.3
Heavy Metals						
Lead	5	mg/kg	110	86	140	260

Client Sample ID			SS123	SS124	SS125	SS126
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30547	S19-De30548	S19-De30549	S19-De30550
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	1.2	3.9	2.6	2.4
Heavy Metals						
Lead	5	mg/kg	480	70	520	110

Client Sample ID			SS127	SS128	SS129	SS130
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30551	S19-De30552	S19-De30553	S19-De30554
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	3.6	2.5	3.2	1.1
Heavy Metals						
Lead	5	mg/kg	89	39	61	190

Client Sample ID			SS131	SS132	SS133	SS134
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30555	S19-De30556	S19-De30557	S19-De30558
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	1.3	< 1	< 1	1.0
Heavy Metals						
Lead	5	mg/kg	240	17	46	42

Client Sample ID			SS135	SS136	SS137	SS138
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-De30559	S19-De30560	S19-De30561	S19-De30562
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
% Moisture						
	1	%	3.2	2.1	< 1	1.1
Heavy Metals						
Lead	5	mg/kg	59	1200	1100	210

Client Sample ID			SS139	SS140	SS141	PAINT1
Sample Matrix			Soil	Soil	Soil	Paint
Eurofins Sample No.			S19-De30563	S19-De30564	S19-De30565	S19-De30587
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Lead (% w/w)						
	0.01	%	-	-	-	0.09
% Moisture						
	1	%	1.1	1.6	1.5	-
Heavy Metals						
Lead	5	mg/kg	800	660	390	-

Client Sample ID			PAINT2	PAINT3	PAINT4	PAINT5
Sample Matrix			Paint	Paint	Paint	Paint
Eurofins Sample No.			S19-De30588	S19-De30589	S19-De30590	S19-De30591
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Lead (% w/w)	0.01	%	0.25	1.8	0.29	0.03

Client Sample ID			PAINT6	PAINT7	PAINT8	D01_191219
Sample Matrix			Paint	Paint	Paint	Soil
Eurofins Sample No.			S19-De30592	S19-De30593	S19-De30594	S19-De30595
Date Sampled			Dec 19, 2019	Dec 19, 2019	Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit				
Lead (% w/w)	0.01	%	0.07	16	15	-
% Moisture	1	%	-	-	-	3.5
Heavy Metals						
Lead	5	mg/kg	-	-	-	320

Client Sample ID			D02_191219	D03_191219
Sample Matrix			Soil	Soil
Eurofins Sample No.			S19-De30596	S19-De30597
Date Sampled			Dec 19, 2019	Dec 19, 2019
Test/Reference	LOR	Unit		
% Moisture	1	%	2.6	2.6
Heavy Metals				
Lead	5	mg/kg	98	1100

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Attention: **Stephen Maxwell**

Report **713198-A**
 Project name
 Project ID **318000780**
 Received Date **Apr 09, 2020**

Client Sample ID			DSWAB_SE_F E (TS)	DSWAB_SE (TS)	DSWAB_FE (TS)	DSWAB_FP (TS)
Sample Matrix			Wipes	Wipes	Wipes	Wipes
Eurofins Sample No.			S20-Ap02132	S20-Ap02134	S20-Ap02135	S20-Ap02136
Date Sampled			Mar 25, 2020	Mar 25, 2020	Mar 25, 2020	Mar 25, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	300	1300	1300	770

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Attention: **Stephen Maxwell**

Report **713198-S**
 Project name
 Project ID **318000780**
 Received Date **Apr 09, 2020**

Client Sample ID			DVAC_CR(TS)
Sample Matrix			Dust
Eurofins Sample No.			S20-Ap02147
Date Sampled			Mar 25, 2020
Test/Reference	LOR	Unit	
Heavy Metals			
Lead	5	mg/kg	1100

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Attention: **Stephen Maxwell**

Report **738091-S**
 Project name **318000780**
 Received Date **Aug 14, 2020**

Client Sample ID			TS_SS01	TS_SS02	TS_SS03	TS_SS04
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Au22712	S20-Au22713	S20-Au22714	S20-Au22715
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	110	550	510	710
% Moisture	1	%	5.4	5.3	4.6	5.0

Client Sample ID			TS_SS05	TS_SS06	TS_SS07	TS_SS08
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Au22716	S20-Au22717	S20-Au22718	S20-Au22719
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	560	580	2000	2400
% Moisture	1	%	5.7	12	2.4	15

Client Sample ID			TS_SS09	TS_SS10	TS_SS11	TS_SS12
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Au22720	S20-Au22721	S20-Au22722	S20-Au22723
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	670	510	170	320
% Moisture	1	%	4.8	35	5.2	4.8

Client Sample ID			TS_SS13	TS_SS14	TS_SS15	TS_SS16
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Au22724	S20-Au22725	S20-Au22726	S20-Au22727
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	420	360	1000	900
% Moisture	1	%	6.5	5.9	3.9	5.3

Client Sample ID			TS_SS17	TS_SS18	TS_SS19	TS_SS20
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Au22728	S20-Au22729	S20-Au22730	S20-Au22731
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	300	470	720	920
% Moisture	1	%	4.4	5.6	6.6	15

Client Sample ID			DUP2	DUP3	TS_PAINT_1	TS_PAINT_2
Sample Matrix			Soil	Soil	Paint	Paint
Eurofins Sample No.			S20-Au22732	S20-Au22733	S20-Au22735	S20-Au22736
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	780	750	-	-
% Moisture	1	%	12	4.4	-	-
Lead (% w/w)	0.01	%	-	-	4.1	4.4

Client Sample ID			TS_PAINT_3	TS_PAINT_4	TS_PAINT_5
Sample Matrix			Paint	Paint	Paint
Eurofins Sample No.			S20-Au22737	S20-Au22738	S20-Au22739
Date Sampled			Aug 11, 2020	Aug 11, 2020	Aug 11, 2020
Test/Reference	LOR	Unit			
Heavy Metals					
Lead (% w/w)	0.01	%	0.04	11	< 0.01

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Attention: **Stephen Maxwell**

Report **738091-W**
 Project name **318000780**
 Received Date **Aug 14, 2020**

Client Sample ID			RINSATE1
Sample Matrix			Water
Eurofins Sample No.			S20-Au22734
Date Sampled			Aug 11, 2020
Test/Reference	LOR	Unit	
Heavy Metals			
Lead	0.001	mg/L	< 0.001

Attachment 3: 95% UCL Calculations

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			ProUCL 5.129-Sep-20 10:36:36 AM								
5	From File			WorkSheet_a.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Lead in Station Surface Soils											
12												
13	General Statistics											
14	Total Number of Observations			25			Number of Distinct Observations			24		
15							Number of Missing Observations			0		
16	Minimum			110			Mean			759		
17	Maximum			2400			Median			580		
18	SD			569.2			Std. Error of Mean			113.8		
19	Coefficient of Variation			0.75			Skewness			1.597		
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic			0.836			Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value			0.918			Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic			0.189			Lilliefors GOF Test					
25	5% Lilliefors Critical Value			0.173			Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL			953.8			95% Adjusted-CLT UCL (Chen-1995)			985.1		
31							95% Modified-t UCL (Johnson-1978)			959.8		
32												
33	Gamma GOF Test											
34	A-D Test Statistic			0.327			Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value			0.756			Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic			0.103			Kolmogorov-Smirnov Gamma GOF Test					
37	5% K-S Critical Value			0.177			Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)			2.12			k star (bias corrected MLE)			1.893		
42	Theta hat (MLE)			358			Theta star (bias corrected MLE)			401.1		
43	nu hat (MLE)			106			nu star (bias corrected)			94.63		
44	MLE Mean (bias corrected)			759			MLE Sd (bias corrected)			551.7		
45							Approximate Chi Square Value (0.05)			73.19		
46	Adjusted Level of Significance			0.0395			Adjusted Chi Square Value			71.91		
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50)			981.3			95% Adjusted Gamma UCL (use when n<50)			998.8		
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic			0.97			Shapiro Wilk Lognormal GOF Test					
53	5% Shapiro Wilk Critical Value			0.918			Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic			0.113			Lilliefors Lognormal GOF Test					
55	5% Lilliefors Critical Value			0.173			Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												

	A	B	C	D	E	F	G	H	I	J	K	L
58	Lognormal Statistics											
59	Minimum of Logged Data					4.7	Mean of logged Data					6.378
60	Maximum of Logged Data					7.783	SD of logged Data					0.756
61												
62	Assuming Lognormal Distribution											
63	95% H-UCL					1100	90% Chebyshev (MVUE) UCL					1153
64	95% Chebyshev (MVUE) UCL					1325	97.5% Chebyshev (MVUE) UCL					1564
65	99% Chebyshev (MVUE) UCL					2034						
66												
67	Nonparametric Distribution Free UCL Statistics											
68	Data appear to follow a Discernible Distribution at 5% Significance Level											
69												
70	Nonparametric Distribution Free UCLs											
71	95% CLT UCL					946.3	95% Jackknife UCL					953.8
72	95% Standard Bootstrap UCL					937.5	95% Bootstrap-t UCL					1024
73	95% Hall's Bootstrap UCL					1028	95% Percentile Bootstrap UCL					945.8
74	95% BCA Bootstrap UCL					975.4						
75	90% Chebyshev(Mean, Sd) UCL					1101	95% Chebyshev(Mean, Sd) UCL					1255
76	97.5% Chebyshev(Mean, Sd) UCL					1470	99% Chebyshev(Mean, Sd) UCL					1892
77												
78	Suggested UCL to Use											
79	95% Adjusted Gamma UCL					998.8						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												