6 May 2021

Kate Madsen
Paua Planning
178 Bawden Road, R. D. 2
Penrose, Auckland 1061

Dear Kate,

Subject: Soil Sampling Assessment –Sub-soils Fill Area 3 (FA3)

Background and Context

EHS Support New Zealand Ltd (EHS Support) was engaged by Paua Planning Limited (Paua Planning) on behalf of Glesson Managed Fill Limited to complete sampling of the sub-surface soils at Fill Area 3 of the proposed Huntly manged fill ('the site'). Waikato Regional Council has raised concerns regarding the potential present of coal mine tailings and overburden material beneath Fill Area 3 which could potentially contaminate the shallow groundwater in the vicinity of Fill Area 3. Paua Planning has also requested EHS Support to verify if any of the material excavated from beneath Fill Area 3 would meet the proposed waste acceptance criteria for the proposed Huntly managed fill.

The work was completed in accordance with our proposal dated 1 April 2021 and this letter presents the findings of the testing and discusses the results of the investigation.

Soil Sampling and Analysis

EHS Support attended the site on 7 April 2021 and undertook the following:

- Three boreholes (HQHA1, HQHA3 and HQHA4) were advanced to 3 m below ground level (bgl) using a 50mm hand auger. The sampling equipment was washed with a solution of Decon-90® detergent and water between sample locations. Sample locations are shown on Figure 1.
- At each borehole location, a representative sample was collected from the recovered core from 1m, 2m and 3 m bgl using a new pair of nitrile gloves. Each sample was placed directly into a laboratory supplied glass jar.
- At sample location HQHA2 and HQHA5, samples were collected from the side walls of an open drainage trench which is approximately 3 m deep and 3 m wide. Samples were collected from 1m, 2m and 3 m bgl depth interval using a decontaminated shovel and gloved hands.
- Soil samples (including one replicate pair) were submitted to Analytica Laboratories Limited under chain of custody conditions for analysis of selected heavy elements (aluminium, arsenic, boron, cobalt, copper, lead, nickel, thallium and zinc). Selected samples were further tested using the synthetic precipitation leaching procedure (SPLP) for the same suite of heavy elements.
- The SPLP testing undertaken on the samples is designed to simulate the maximum about of inorganic elements that could be leached from the soil via natural rainfall.
- Selected samples collected from geotechnical investigation boreholes BH301 and BH302 were analysed for heavy elements and leachable metals.

Figure 1 (Attachment B) shows the sample locations.

Results

In general, soil comprised silty CLAY / clayey SILT to approximately 3 m bgl at sample location HQHA1 through HQHA5. Coal fragments/pieces were noted in soil recovered from location HQHA2 through HQHA5. Borehole logs and sample location plans are presented in Attachment B.

Analytical results are summarised in Table 1 and 2 (in Attachment C). The laboratory reports are provided in Attachment D. Results have been compared with the following assessment criteria:

- Background concentrations for selected elements in soil of the Waikato region.
- Proposed waste acceptance criteria for the Huntly Managed fill (PDP Ltd, 2020).
- Waste acceptance criteria for Class B landfill ((MfE, 2004).
- Australian & New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)

In summary, the current investigation results show that:

- Concentrations of most inorganic elements (arsenic, copper, lead, mercury, and nickel) detected in some of the analysed samples were below the published background concentrations for the Waikato Region.
- Concentrations of boron and zinc were elevated above Waikato Regional background levels in some samples.
- Soil concentrations do vary between sampling locations.
- All the reported inorganic element concentrations were below the proposed waste acceptance criteria for the Huntly Managed fill except for boron in samples collected from location HQHA2. However, the calculated 95% upper confidence level of the mean for boron is 29.43 mg/kg which is within the proposed waste acceptance criterion of 45 mg/kg. It is recommended that if material from around sampling location HQHA2 is to be deposited within the managed fill then additional SPLP testing for boron is undertaken[1].
- Concentrations of leachable aluminium in sample HA1-3.0, BH301-1.5m, BH301-10.0m and BH302-1.0m were above the waste acceptance criteria for Class B landfill. However, this may be due to the presence of colloids clay particles.
- Additionally, some of the leachable heavy elements were detected above the ANZG guideline levels for 80% ecosystem protection.

Conclusion and recommendation

The current investigation results show that the sub-soils from beneath Fill Area 3 are likely to meet the proposed waste acceptance criteria for the proposed Huntly Managed Fill. However, additional soil testing (for As, B, Cu, Pb, Ni, Tl and Zn) and SPLP testing for boron may need to be undertaken at a rate of one sample per 1,000 m^3 (as per the proposed consent requirement (AUTH141283.03.01)). As the number of test required will depend on where and how much material is to be excavated. Some of the results within this report can be used to verify compliance with the consent requirements if the samples have been collected in the material being excavated. Gleeson Managed

[1] At this stage it is not possible to actually predicted the water quality from the soil sub drains as water from different areas could have very different chemical composition and the composition will change over time. Therefore, this water will be collected a water treatment pond or tank and tested to determine level of treatment required.

Fill Limited will then need to calculate if additional sampling will be required to meet the consent conditions.

The elevated concentrations of boron and zinc and SPLP testing (which may over predictive the final concentration of inorganic elements in the groundwater discharged from the sub-soil drains) indicates that there is the potential for the groundwater to have elevated concentrations of certain inorganic elements (particularly boron and zinc). Therefore, EHS Support recommends that the discharge from these drains is not directly discharged into the small stream to the north and east of Fill Area 3. Instead, it is recommended that the water from the sub-soil drains is collected and diverted for storage and testing into a treatment pond (or tank). Once the water has been tested to determine the actual water quality then a decision can be made to either discharge the water into the stormwater retention pond for treatment or removed for off-site treatment and disposal.

The water quality management plan will need to be updated to including:

- Frequency and type of testing required.
- Trigger levels for determining level of treatment required of water from the sub-soil drains.
- Decision tree outlying various management options for treatment of the water.

Should you have any questions or require additional information, please feel free to contact me at 021 295 2284.

Sincerely,

Andrew Rumsby

Andrew Rumsby
Principal Environmental Chemist

Appendix A – Statement of Limitations

EHS Support New Zealand Limited ("EHS Support") has prepared this document in accordance with the usual care and thoroughness of the consulting profession for the use of Paua Planning Limited and only those third parties who have been authorised in writing by EHS Support to rely on this document. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this document. It is prepared in accordance with the scope of work and for the purpose outlined in EHS Support email proposal to Paua Planning dated 1 April 2021 and the terms and conditions outlined the Short Form Agreement for Consultant Engagement dated 21 September 2020.

The methodology adopted and sources of information used by EHS Support are outlined in this document. EHS Support has made no independent verification of this information beyond the agreed scope of works and EHS Support assumes no responsibility for any inaccuracies or omissions. No indications were found during the preparation of this document that information contained in this document as provided to EHS Support was false.

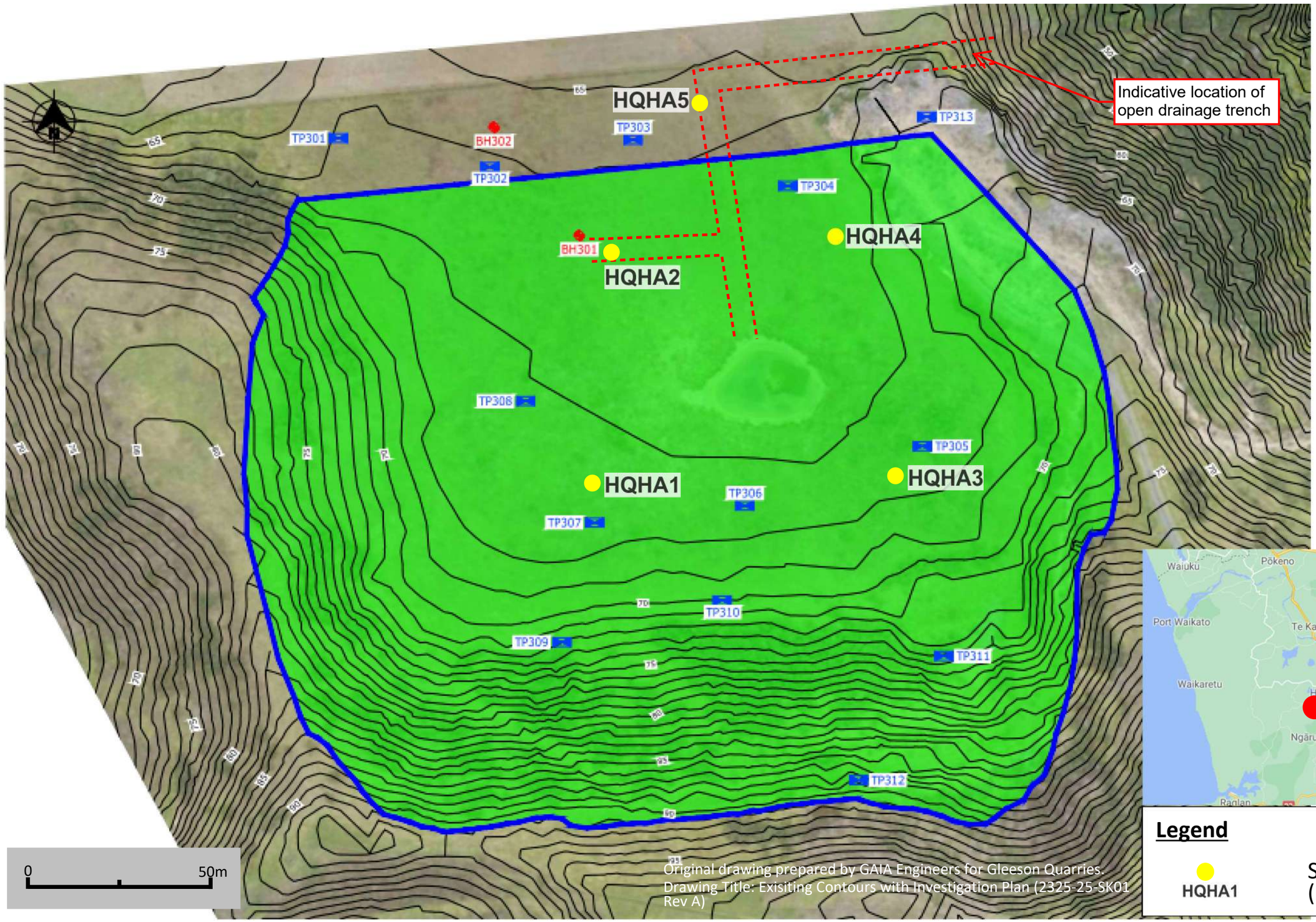
This document was prepared on the issue date and is based on the information available at the time of preparation. EHS Support disclaims responsibility for any changes that may have occurred after this time.

This document should be read in full. No responsibility is accepted for use of any part of this document in any other context or for any other purpose or by third parties. This document does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this document, EHS Support must be notified of any such findings and be provided with an opportunity to review the recommendations of this document.

Whilst to the best of our knowledge information contained in this document is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time. Therefore, this document and the information contained herein should only be regarded as valid at the time of writing, unless otherwise explicitly stated in this document.

Attachment B – Borehole Logs and Sample Location Plan



EHS Support	**Project** Huntly Managed Fill - Fill Area 3	**Client** PAUA PLANNING	Figure 1
	Title Sample Location Plan		Drawn: JH / Checked: AR
			Date: April 2021 / For Information Only

EHS Support

Project Number:

Project: Huntly Quarry - Disposal Site Fill # 3

Excavation Date: 7 April 2021

Excavation method: Hand auger

Total depth: 3 m bgl

Hand Auger Hole ID: HQHA1

Comments:

Logged by: JH

Checked by: AR

Soil Samples	Depth (m)	Soil Description	Well Construction
HA1 0-0.1		TOPSOIL, SILT with some rootlets, brown, moist, soft	
		CLAY with some silt, light brown with orange mottling, dry, firm	
	0.5	CLAY with some silt, brown, dry, firm	
		SILT with some clay, dark grey, stiff water seeping in from 0.8 m bgl	
HA1-1.0	1		
	1.5		
HA1-2.0	2		
	2.5		
		become wet and soft from 2.7 m	
HA1-3.0	3	End of hole 3 m bgl.	
	3.5		
	4		
	4.5		

EHS Support

Project Number:

Project: Huntly Quarry - Disposal Site Fill # 3

Excavation Date: 7 April 2021

Excavation method: NA

Total depth: 3 m bgl

Hand Auger Hole ID: HQHA2

Comments: samples collected from open trench dug for geotechnical investigation

Logged by: JH

Checked by: AR

Soil Samples	Depth (m)	Soil Description	Well Construction
HA2 0-0.1	0	FILL, silty CLAY with rock pieces up to 15 cm diameter and coal fragments, brown, stiff	
	0.5		
HA2-1.0	1		
	1.5		
HA2-2.0	2		
	2.5		
		Wet from 2.8 m	
HA2-3.0 / DUPA	3	End of hole 3 m bgl.	
	3.5		
	4		
	4.5		

EHS Support

Project Number:

Project: Huntly Quarry - Disposal Site Fill # 3

Excavation Date: 7 April 2021

Excavation method: Hand auger

Total depth: 3 m bgl

Hand Auger Hole ID: HQHA3

Comments:

Logged by: JH

Checked by: AR

Soil Samples	Depth (m)	Soil Description	Well Construction
HA3 0-0.1	0	TOPSOIL, SILT with some rootlets, dark brown, dry, soft	
		CLAY with some silt, brown mottled orange brown, dry, firm	
	0.5		
		SILT with some clay, dark grey, dry, firm/stiff	
HA3-1.0	1		
	1.5		
HA3-2.0	2		
	2.5	SILT with some clay and some small coal fragments, wet, soft	
HA3-3.0	3	End of hole 3 m bgl.	
	3.5		
	4		
	4.5		

EHS Support

Project Number:

Project: Huntly Quarry - Disposal Site Fill # 3

Excavation Date: 7 April 2021

Excavation method: Hand auger

Total depth: 3 m bgl

Hand Auger Hole ID: HQHA4

Comments:

Logged by: JH

Checked by: AR

Soil Samples	Depth (m)	Soil Description	Well Construction
HA4 0-0.1	0	FILL, clay with some silt and coal fragments/pieces, orange brown, dry, firm	
	0.5		
HA4-1.0	1		
	1.5	SILT with some clay, grey, dry, very stiff	
HA4-2.0	2		
	2.5	Clayey SILT, grey, moist, stiff wet from 2.6 m, soft with minor coal pieces	
HA4-3.0	3	End of hole 3 m bgl.	
	3.5		
	4		
	4.5		

EHS Support

Project Number:

Project: Huntly Quarry - Disposal Site Fill # 3

Excavation Date: 7 April 2021

Excavation method: NA

Total depth: 2.8 m bgl

Hand Auger Hole ID: HQHA5

Comments: samples collected from open trench dug for geotechnical investigation

Logged by: JH

Checked by: AR

Soil Samples	Depth (m)	Soil Description	Well Construction
HA5 0-0.1	0	FILL, silty CLAY with rock pieces up to 15 cm diameter and coal fragments, brown, stiff	
	0.5		
HA5-1.0	1		
	1.5		
HA5-2.0	2		
	2.5		
		Wet from 2.8 m	
HA5-3.0/ DUPB	3	End of hole 3 m bgl.	
	3.5		
	4		
	4.5		

BOREHOLE LOG

HOLE NO.: BH301

CLIENT: Gleeson Quarries Ltd.
PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly
START DATE: 01/03/2021
CO-ORDINATES: 5838034mN , 1789392mE **GROUND RL:** 66.28 m
END DATE: 03/03/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING (FR SW MW HW EW)	STRENGTH (EW VW W MS S VS ES)	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
Fill	Clayey SILT, with minor organic staining; light brown-orange. Stiff; low plasticity.	1		73							Rotary cored	Water Level Not Measured	
	Clayey SILT, with minor fibrous organic clasts, with trace gravel; brown, grey and black mottles. Firm; low plasticity; gravel, coarse, slightly weathered, Mudstone.			22				2, 2 / 2, 2, 1, 1 N=6					
	Core Loss: 1.95 to 2.4m	2		0									
	Clayey SILT, with minor fibrous organic clasts, with trace gravel; brown, grey and black mottles. Firm; low plasticity; gravel, coarse, slightly weathered, Mudstone.			100									
		3		100				2, 1 / 1, 1, 1, 0 N=3					
	Core Loss: 3.45 to 3.9m			0									
	Clayey SILT, with minor fibrous organic clasts, with trace gravel; brown, grey and black mottles. Firm; low plasticity; gravel, coarse, slightly weathered, Mudstone.	4		100									
				100				4, 6 / 3, 2, 2, 2 N=9					

REMARKS
LOGGED BY: MK
CHECKED BY: KCC
APPROVED BY: KCC
STATUS: PRELIM
CONTRACTOR: Drill Force
RIG: Tractor
DRILLER: Conan

REF	DATE / TIME	LEVEL	REMARK

LOGGED IN ACCORDANCE WITH NEW ZEALAND GEOTECHNICAL SOCIETY GUIDELINES (2005)

Gaia Engineers Ltd
5 Carmont Place,
Mt Wellington
Auckland 1060,
New Zealand

P O Box 51 295,
Pakuranga
Auckland 2140,
New Zealand

info@gaia-engineers.co.nz

BOREHOLE LOG

HOLE NO.: BH301

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PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

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END DATE: 03/03/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%) (25 50 75)	GRAPHIC	WEATHERING (FR SW MW HW EW)	STRENGTH (EW VW W MS S VS ES)	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
	Core Loss: 4.95 to 5.6m												
Fill	Clayey SILT, with minor fibrous organic clasts, with trace gravel; brown, grey and black mottles. Firm; low plasticity; gravel, coarse, slightly weathered, Mudstone.	6		100				1, 1 / 1, 1, 2, 2 N=6			Rotary cored	Water Level Not Measured	
				100									
		7		100									
				100				1, 1 / 2, 2, 1, 2 N=7					
	Core Loss: 7.95 to 8.6m	8		0									
	Clayey SILT, with minor fibrous organic clasts, with trace gravel; brown, grey and black mottles. Firm; low plasticity; gravel, coarse, slightly weathered, Mudstone.			100									
	Silty CLAY; brown and blue-grey, oxidises to light brown. Soft to firm; high plasticity.	9		100				0, 0 / 0, 0, 1, 1 N=2					
	Core Loss: 9.45 to 9.9m			0									
	Silty CLAY; brown and blue-grey, oxidises to light			100									

REMARKS
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BOREHOLE LOG

HOLE NO.: BH301

CLIENT: Gleeson Quarries Ltd.

PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly

START DATE: 01/03/2021

CO-ORDINATES: 5838034mN , 1789392mE **GROUND RL:** 66.28 m

END DATE: 03/03/2021

SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
Fill	brown. Soft to firm; high plasticity.			100							Rotary cored	Water Level Not Measured	
	Clayey SILT, with some fibrous organics (decomposed wood fragments); light grey and light brown. Stiff; low plasticity.			100				0, 1 / 1, 1, 1, 1 N=4					
	Core Loss: 10.95 to 11.2m	11		0									
	Clayey SILT, with trace fibrous organics; light grey and light brown. Stiff; low plasticity.												
	Clayey SILT, with some sand, with trace organic inclusions and staining; dark brown, light blue-grey and light brown. Low plasticity; sand, pumiceous .			100									
		12		100				0, 0 / 0, 1, 2, 2 N=5					
		13		100									
				100				0, 0 / 0, 0, 1, 1 N=2					
		14		100									
	Clayey sandy SILT, with trace organic staining; dark brown. Stiff; low plasticity. 14.9m - 15.1m: Some organic disseminated fibers												

REMARKS

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PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

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END DATE: 03/03/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
Fill	[CONT] Clayey sandy SILT, with trace organic staining; dark brown. Stiff; low plasticity.	16		100				0, 1 / 2, 1, 1, 1 N=5			Rotary cored	Water Level Not Measured	
				100				1, 0 / 1, 1, 1, 2 N=5					
	Core Loss: 16.95 to 17.4m	17		0									
	Clayey sandy SILT, with trace organic staining; dark brown. Stiff; low plasticity.			100									
	Clayey SILT, with some gravel; brownish. Low plasticity; gravel, Sandstone.	18						2, 3 / 2, 4, 4, 5 N=15					
	Silty CLAY; brown-orange and dark brown mottles. Stiff; low plasticity.			100									
	GRAVEL. Gravel, medium, subangular.	19		100									
	TOPSOIL; dark brown.												
	Core Loss: 19.5 to 19.95m			0				2, 5 / 5, 5, 4, 3 N=17					

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BOREHOLE LOG

HOLE NO.: BH301

CLIENT: Gleeson Quarries Ltd.
PROJECT: Huntly Quarry Fill Sites
JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly
START DATE: 01/03/2021
CO-ORDINATES: 5838034mN , 1789392mE **GROUND RL:** 66.28 m
END DATE: 03/03/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
	Core Loss: 19.95 to 20.9m												
Fill	GRAVEL; greyish. Gravel, medium to coarse, subround.	21		100									
Waikato Coal Measures	Completely weathered; greyish brown; SILTSTONE; extremely weak; sandy SILT with MnO staining on defects, non plastic.			100		EW		5, 5 / 6, 4, 4, 11 N=25					
		22		100							Rotary cored	Water Level Not Measured	
	Moderately weathered; orange and light brown; fine fabric, thinly laminated; SILTSTONE; very weak.			100				2, 4 / 10, 17, 11, 10 N=48					
		23		0		HW							
				100									
	Slightly weathered; grey ; SILTSTONE; moderately strong.					MW							
	EOH: 24.00m	24						2, 8 / 50 for 60mm N=50 for 60mm					

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BOREHOLE LOG

HOLE NO.: BH302

CLIENT: Gleeson Quarries Ltd.
PROJECT: Huntly Quarry Fill Sites
JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly
START DATE: 24/02/2021
CO-ORDINATES: 5838065mN , 1789368mE **GROUND RL:** 66.28 m
END DATE: 26/02/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING (FR SW MW HW EW)	STRENGTH (EW VW W MS S VS ES)	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
	TOPSOIL.												
	Silty CLAY; light grey and brown. High plasticity.												
	Silty CLAY; light grey and brown. High plasticity.												
	Silty CLAY, with some organic inclusions; dark brown, grey and black mottles. Stiff; low plasticity.	1		58									
	CLAY & SILT, with trace organic staining and sand; grey, blue-grey and dark brown mottles. Stiff; low plasticity; sand, fine.			33				1, 2 / 1, 1, 0, 1 N=3					
	2.4m - 2.4m: with some organic staining, dark grey and dark brow mottles	2		87							Rotary cored		
		3		90				0, 0 / 0, 1, 1, 1 N=3					
	Core Loss: 3.45 to 4.4m	4		0									
	Silty CLAY; light grey and light brown-orange mottles . Firm; high plasticity.			100				1, 0 / 1, 0, 1, 1 N=3					
				100									

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BOREHOLE LOG

HOLE NO.: BH302

CLIENT: Gleeson Quarries Ltd.
PROJECT: Huntly Quarry Fill Sites
JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly
START DATE: 24/02/2021
CO-ORDINATES: 5838065mN , 1789368mE **GROUND RL:** 65.64 m
END DATE: 26/02/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
	[CONT] Silty CLAY; light grey and light brown-orange mottles . Firm; high plasticity.												
	5.3m - 5.3m: becoming dark brown-orange and dark brown, some fibrous organic inclusions	6		100				2, 2 / 1, 1, 2, 1 N=5					
	Sandy SILT; dark brown with occaisional orange mottles. Stiff; low plasticity.	7		100									
	Clayey SILT, with trace organic inclusions; dark brown with occaisional orange mottles. Firm; high plasticity.			100				0, 0 / 1, 0, 0, 1 N=2			Rotary cored		
	Clayey SILT, with some organic staining; dark brown and grey mottles. Stiff; low plasticity.	8		57									
		9		100				1, 1 / 1, 1, 2, 1 N=5					
				48									

REMARKS
LOGGED BY: MK
CHECKED BY: KCC
APPROVED BY: KCC
STATUS: PRELIM
CONTRACTOR: Drill Force
RIG: Tractor
DRILLER: Conan

REF	DATE / TIME	LEVEL	REMARK

LOGGED IN ACCORDANCE WITH NEW ZEALAND GEOTECHNICAL SOCIETY GUIDELINES (2005)

Gaia Engineers Ltd
5 Carmont Place,
Mt Wellington
Auckland 1060,
New Zealand

P O Box 51 295,
Pakuranga
Auckland 2140,
New Zealand

info@gaia-engineers.co.nz

BOREHOLE LOG

HOLE NO.: BH302

CLIENT: Gleeson Quarries Ltd.
PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly
START DATE: 24/02/2021
CO-ORDINATES: 5838065mN , 1789368mE **GROUND RL:** 65.64 m
END DATE: 26/02/2021
SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
	[CONT] Clayey SILT, with some organic staining; dark brown and grey mottles. Stiff; low plasticity. 10.2m - 10.2m: with trace mudstone inclusions			48				0, 1 / 0, 0, 1, 1 N=2					
				100									
	Silty CLAY, with trace orgnanic staining and sand; dark grey brown. Stiff to very stiff; high plasticity; sand, fine.	11											
	11.4m - 11.4m: trace sandy silt inclusions			100									
		12						0, 0 / 0, 2, 1, 1 N=4			Rotary cored		
				100									
	12.9m - 12.9m: becoming light grey mottles	13		100									
								0, 0 / 1, 2, 1, 2 N=6					
		14		100									

REMARKS
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START DATE: 24/02/2021
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GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
	[CONT] Silty CLAY, with trace orgnanic staining and sand; dark grey brown. Stiff to very stiff; high plasticity; sand, fine.			100				0, 0 / 2, 1, 2, 2 N=7					
	15.5m - 15.5m: becoming dark grey-brown, no inclusions	16		100									
				100				1, 2 / 3, 2, 3, 4 N=12					
	17.0m - 17.0m: becoming light grey and orange mottles, trace sandy silt inclusions	17											
	17.4m - 17.6m: CLAY; light blue-grey and orange mottles. Firm; high plasticity.			100							Rotary cored		
		18		100				4, 5 / 3, 2, 5, 5 N=15					
Fill	Silty GRAVEL. Stiff; gravel, medium to coarse, rounded to subangular, moderately weathered, Mudstone.	19		100									
				100				3, 5 / 5, 6, 7, 7 N=25					

REMARKS
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CLIENT: Gleeson Quarries Ltd.

PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly

START DATE: 24/02/2021

CO-ORDINATES: 5838065mN , 1789368mE **GROUND RL:** 65.64 m

END DATE: 26/02/2021

SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
Fill	CLAY & SILT, with trace gravel; dark brown, brown and orange mottles. Very stiff; low plasticity; gravel, coarse, Mudstone.	21		100				3, 4 / 5, 6, 7, 9 N=27					
Fill	Silty CLAY; dark grey and dark brown mottles. Very stiff; low plasticity.												
Fill	Slightly weathered; dark brown; fine fabric, laminated; SILTSTONE; weak.												
Fill	Clayey SILT, with some gravel; dark grey and dark brown mottles. Hard; low plasticity; gravel, coarse, subround, slightly weathered, Mudstone.	22		100									
Waikato Coal Measures	Highly weathered; dark brown; fine fabric, laminated; SILTSTONE; extremely weak. Clayey SILT, with minor coal inclusions. Hard; non-plastic.	23		100		HW	EW	2, 4 / 4, 7, 8, 7 N=26			Rotary cored		
Waikato Coal Measures				100									
Waikato Coal Measures		24						2, 3 / 5, 7, 7, 6 N=25					

REMARKS

LOGGED BY: MK

CHECKED BY: KCC

APPROVED BY: KCC

STATUS: PRELIM

CONTRACTOR: Drill Force

RIG: Tractor

DRILLER: Conan

REF	DATE / TIME	LEVEL	REMARK

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PROJECT: Huntly Quarry Fill Sites

JOB NO.: 2325

SITE LOCATION: Huntly Quarry Fill Site - 300 Riverview Road, Huntly
START DATE: 24/02/2021

CO-ORDINATES: 5838065mN , 1789368mE **GROUND RL:** 65.64 m
END DATE: 26/02/2021

SURVEY CIRCUIT: MTEDEN2000 **DATUM:** NZVD2016 **WEATHER:** Fine

GEOLOGY	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	DEPTH (m) / RL (m)	SAMPLE TYPE	TCR (%)	GRAPHIC	WEATHERING	STRENGTH	SPT DATA	VANE SHEAR STRENGTH (kPa)	NOTES, DEFECTS, SAMPLES & LABORATORY TEST RESULTS	METHOD	WATER LEVEL	PIEZOMETER INSTALLATION
Waikato Coal Measures	[CONT] Highly weathered; dark brown; fine fabric, laminated; SILTSTONE; extremely weak. Clayey SILT, with minor coal inclusions. Hard; non-plastic. 25.3m - 25.4m: Slightly weathered; dark grey-brown; , laminated; CLAYSTONE; very weak. EOH: 25.95m	26 27 28 29		25 50 75		HW / EW	EW / VW	5, 10 / 10, 6, 10, 12 N=38			Rotary cored		

REMARKS
LOGGED BY: MK
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RIG: Tractor
DRILLER: Conan

REF	DATE / TIME	LEVEL	REMARK

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GAIA ENGINEERS

CORE PHOTOS

HOLE NO.: BH301

JOB NO.: 2325

0.00-6.00m

6.00-10.50m

10.50-14.40m

14.40-18.00m

18.00-24.00m

CORE PHOTOS

HOLE NO.: BH302

JOB NO.: 2325

0.00-3.45m

3.45-7.50m

7.50-12.00m

12.00-13.95m

13.95-16.50m

16.50-19.00m

19.00-21.90m

21.45-25.95m

21.90-24.45m

Attachment C – Sample Results Table

Table 1. Total Metals in Soils in Mannaged Fill Area 3 (Exisiting Soils)											
Reference	Sample Description	Sample Date	Arsenic	Boron	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
			(As)	(B)	(Cd)	(Cr)	(Cu)	(Pb)	(Hg)	(Ni)	(Zn)
			mg/kg dry wt								
21-15906	HA1 0-0.1	07 April 2021	*14.5*	**11**	0.031	9.4	16.8	*24.7*	0.11	4.2	33.5
21-15906	HA1 1.0	07 April 2021	3.7	**21**	0.074	8.8	21.2	17.2	0.19	*12.3*	**77.8**
21-15906	HA1 2.0	07 April 2021	3	**24**	0.063	8.5	19.7	16.9	0.19	*7.91*	**77**
21-15906	HA1 3.0	07 April 2021	3.6	**20**	0.065	8.6	19.6	15.5	0.21	*8.14*	**86.8**
21-15906	HA2 0-0.1	07 April 2021	2.2	**48**	0.045	9.6	15.5	13.3	0.13	6.2	34.8
21-15906	HA2 1.0	07 April 2021	2.7	**68**	0.068	7.9	19.4	15.4	0.16	*8.77*	**66**
21-15906	HA2 2.0	07 April 2021	3.8	**37**	0.064	7.7	20	16.2	0.19	*9.42*	**75.7**
21-15906	HA2 3.0	07 April 2021	3	**45**	0.082	8.7	20.4	*23.4*	0.19	*10.6*	**77.5**
21-15906	HA3 0-0.1	07 April 2021	*11*	**12**	0.031	9.7	17.1	*22.3*	0.095	6.27	**59.7**
21-15906	HA3 1.0	07 April 2021	5.2	**16**	0.13	8.5	*26.5*	18.9	0.2	*12.9*	**76.1**
21-15906	HA3 2.0	07 April 2021	3.4	**22**	0.092	8.4	22.8	18.7	0.2	*12.4*	**89.3**
21-15906	HA3 3.0	07 April 2021	1.6	**29**	0.052	8.7	19.4	17.3	*0.23*	7.53	*75.6*
21-15906	HA4 0-0.1	07 April 2021	4.9	4.4	0.043	9.5	8.96	17.1	0.11	5.1	29.9
21-15906	HA4 1.0	07 April 2021	4.9	**12**	0.023	9.2	21.2	19.2	*0.23*	3.5	36.4
21-15906	HA4 2.0	07 April 2021	3.1	**22**	0.048	7	16.4	14.8	0.18	6.38	*57.9*
21-15906	HA4 3.0	07 April 2021	2.7	***18***	0.11	7.8	19.9	17.1	0.18	*10.4*	**81.1**
21-15906	HA4 3.0	07 April 2021	5.1	***20***	0.099	9	20.5	17.1	0.19	*11.1*	**78.4**
21-15906	HA5 1.0	07 April 2021	4.6	***12***	0.036	11	16.7	16.9	*0.23*	5.77	47.4
21-15906	HA5 2.0	07 April 2021	6	***11***	0.042	10	18.4	*21.6*	0.14	*8*	**70.3**
21-15906	HA5 3.0	07 April 2021	*11*	***16***	0.015	9.1	16.5	*31.1*	0.2	3.5	28.8
2579454	BH301 - 1.0m	06 April 2021	< 2	< 20	< 0.10	5	20	19.1	N/A	3	**66**
2579454	BH301 - 1.5m	06 April 2021	2	< 20	< 0.10	6	21	16.1	N/A	*8*	**59**
2579454	BH301 - 3.0m	06 April 2021	< 2	**26**	< 0.10	7	20	17.2	N/A	6	*55*
2579454	BH301 - 6.0m	06 April 2021	< 2	***22***	< 0.10	5	17	15	N/A	7	*54*
2579455	BH301 - 8.7m	06 April 2021	3	***22***	0.1	5	22	15.8	N/A	7	**84**
2579455	BH301 - 10.0m	06 April 2021	4	< 20	< 0.10	5	*34*	*20*	N/A	3	**83**
2579455	BH302 - 1.0m	06 April 2021	3	< 20	< 0.10	5	19	*22*	N/A	*15*	**91**
2579455	BH302 - 1.8m	06 April 2021	4	< 20	< 0.10	6	23	17.7	N/A	*9*	**86**
2579455	BH302 - 3.0m	06 April 2021	6	< 20	< 0.10	5	20	17.3	N/A	7	50
2579454	BH302 - 6.0m	06 April 2021	*12*	< 20	< 0.10	6	20	17.8	N/A	*10*	**92**
2579454	BH302 - 7.6m	06 April 2021	*7*	< 20	< 0.10	5	23	11.7	N/A	< 2	15
2579454	BH302 - 10.0m	06 April 2021	*13*	< 20	< 0.10	9	19	*23*	N/A	*9*	*55*
95% UCL			6.524	29.43	0.0741	8.24	21.03	19.48	0.193	8.808	70.34
Huntly Waste Acceptance Criteria			100	45 (260)	7.5	400	325	250 (1000)	1.5	63 (320)	400 (2,000)
Waikato Background Levels (95%)			6.8	6.7	0.22	30	25	20	0.23	7.6	53
Waikato Background Levels (maximum)			25	8.5	0.3	150	55	32	0.5	21	58

Highlighted Yellow: above the proposed Huntly Managed Fill waste acceptance criteria

Italic above published 95% background concentration for the Waikato Region

Bold: above the published maximum background concentrations for the Waikato region

EHS Support

Table 2. Results of SPLP testing

Lab Reference	Sample Desc	Sample Date	Initial pH	Final pH	Aluminium*	Arsenic	Boron	Cobalt	Copper	Lead	Nickel	Thallium	Zinc
					g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3
21-16875	HA1 3.0	4/7/2021	5.7	7.4	7.19	<0.005	0.5	0.0007	<0.01	<0.005	N/A	<0.002	<0.05
21-16875	HA2 0.1	4/7/2021	5.7	7.8	2.94	<0.005	0.6	0.0002	<0.01	<0.005	N/A	<0.002	<0.05
21-16875	HA2 1.0	4/7/2021	5.7	6.8	<0.2	<0.005	0.7	0.0005	<0.01	<0.005	N/A	<0.002	<0.05
21-16875	HA3 2.0	4/7/2021	5.7	6	<0.2	<0.005	0.3	0.0728	<0.01	<0.005	N/A	<0.002	0.24
21-16875	HA4 3.0	4/7/2021	5.7	7.5	1.44	<0.005	0.3	0.0003	<0.01	<0.005	N/A	<0.002	<0.05
21-16875	HA5 3.0	4/7/2021	5.7	3.4	1.28	<0.005	<0.2	0.0189	0.02	<0.005	N/A	<0.002	0.38
2579454.13	BH301 - 1.0m [SPLP Extract]			9	1.95	< 0.021	0.25	< 0.0042	< 0.011	0.0088	< 0.011	< 0.0011	0.044
2579454.14	BH301 - 1.5m [SPLP Extract]			9.3	4.7	< 0.021	1.51	< 0.0042	0.014	0.0178	< 0.011	< 0.0011	0.029
2579454.15	BH301 - 3.0m [SPLP Extract]			8.1	1.25	< 0.021	0.29	< 0.0042	< 0.011	0.0049	< 0.011	< 0.0011	< 0.021
2579454.16	BH301 - 6.0m [SPLP Extract]			8.9	2.1	< 0.021	0.32	< 0.0042	< 0.011	0.0076	< 0.011	< 0.0011	< 0.021
2579454.17	BH301 - 8.7m [SPLP Extract]			9.6	2.8	< 0.021	1.3	< 0.0042	< 0.011	0.0096	< 0.011	< 0.0011	0.027
2579454.18	BH301 - 10.0m [SPLP Extract]			9.1	4.8	< 0.021	0.16	< 0.0042	0.027	0.0098	< 0.011	< 0.0011	0.061
2579454.19	BH302 - 1.0m [SPLP Extract]			9.2	4.5	< 0.021	0.2	< 0.0042	< 0.011	0.008	< 0.011	< 0.0011	0.022
2579454.2	BH302 - 1.8m [SPLP Extract]			9.3	3.8	< 0.021	0.29	< 0.0042	< 0.011	0.0043	< 0.011	< 0.0011	< 0.021
2579454.21	BH302 - 3.0m [SPLP Extract]			7.4	0.63	< 0.021	< 0.11	0.0139	< 0.011	< 0.0021	< 0.011	< 0.0011	< 0.021
2579454.22	BH302 - 6.0m [SPLP Extract]			8.7	3	< 0.021	0.17	< 0.0042	< 0.011	< 0.0021	< 0.011	< 0.0011	< 0.021
2579454.23	BH302 - 7.6m [SPLP Extract]			8.7	3.9	< 0.021	< 0.11	< 0.0042	< 0.011	0.0048	< 0.011	< 0.0011	< 0.021
2579454.24	BH302 - 10.0m [SPLP Extract]			9.1	3.2	< 0.021	0.13	< 0.0042	< 0.011	0.0039	< 0.011	< 0.0011	< 0.021
Huntly Waste Acceptance criteria					NGV	NGV	2	NGV	NGV	1	NGV	NGV	1
Class B landfill					4	0.5	2	NGV	0.5	0.5	1	NGV	1
ANZG (2018)	80%				NGV	0.36	1.3	NGV	0.0025	0.0094	0.017	NGV	0.031
ANZG (2018)	95%				0.0008	0.024	0.37	0.0014	0.0014	0.0034	0.011	0.00003	0.008

above current ANZG (2018) guidelines levels for 95% ecosystem protection

above proposed ANZG (2018) guidelines levels for 95% ecosystem protection for boron

above Class B landfill acceptance criteria (source: MfE Hazardous waste Guidelines, Landfill Waste Acceptance Criteria and Landfill Classification, May 2004)

EHS Support

Attachment C – Laboratory Reports

Analytica Laboratories Limited
Ruakura Research Centre
10 Bisley Road
Hamilton 3214, New Zealand
Ph +64 (07) 974 4740
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

EHS Support New Zealand Ltd
PO Box 15887
Auckland 0604

Attention: Andrew Rumsby
Phone: 021 1020 533
Email: andrew.rumsby@ehs-support.com

Sampling Site: Huntly Q

Lab Reference: 21-16875
Submitted by: JH
Date Received: 14/04/2021
Testing Initiated: 14/04/2021
Date Completed: 27/04/2021
Order Number: Huntly Q
Reference: Huntly Q

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

AMENDED REPORT. This report replaces in full a previous version R00 sent on 21/04/21. Amended element selection.

Trace Elements by SPLP

			Client Sample ID	HA1 3.0	HA2 0.1	HA2 1.0	HA3 2.0	HA4 3.0
			Date Sampled	07/04/2021	07/04/2021	07/04/2021	07/04/2021	07/04/2021
Analyte	Unit	*Reporting Limit*		21-16875-1	21-16875-2	21-16875-3	21-16875-4	21-16875-5
Aluminium*	g/m^3	*0.2*		7.19	2.94	<0.20	<0.20	1.44
Arsenic	g/m^3	*0.005*		<0.005	<0.005	<0.005	<0.005	<0.005
Boron	g/m^3	*0.2*		0.5	0.6	0.7	0.3	0.3
Cobalt	g/m^3	*0.0001*		0.0007	0.0002	0.0005	0.0728	0.0003
Copper	g/m^3	*0.01*		<0.01	<0.01	<0.01	<0.01	<0.01
Lead	g/m^3	*0.005*		<0.005	<0.005	<0.005	<0.005	<0.005
Thallium	g/m^3	*0.002*		<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	g/m^3	*0.05*		<0.05	<0.05	<0.05	0.24	<0.05

Trace Elements by SPLP

			Client Sample ID	HA5 3.0
			Date Sampled	07/04/2021
Analyte	Unit	*Reporting Limit*		21-16875-6
Aluminium*	g/m^3	*0.2*		1.28
Arsenic	g/m^3	*0.005*		<0.005
Boron	g/m^3	*0.2*		<0.2
Cobalt	g/m^3	*0.0001*		0.0189
Copper	g/m^3	*0.01*		0.02
Lead	g/m^3	*0.005*		<0.005
Thallium	g/m^3	*0.002*		<0.002
Zinc	g/m^3	*0.05*		0.38

Elements in Soil

			Client Sample ID	HA3 2.0	HA3 3.0	HA4 0-0.1	HA4 1.0	HA4 2.0
			Date Sampled					
Thallium	mg/kg dry wt	*0.025*		0.23	0.16	0.21	0.21	0.15

Elements in Soil

		Client Sample ID	HA4 3.0	HA5 1.0	HA5 2.0	HA5 3.0	DUP B
		Date Sampled					
Analyte	Unit	*Reporting Limit*	21-18868-16	21-18868-17	21-18868-18	21-18868-19	21-18868-20
Aluminium*	mg/kg dry wt	*2.5*	14,200	30,000	55,500	24,500	27,100
Cobalt	mg/kg dry wt	*0.025*	9.37	4.24	9.35	3.31	3.79
Thallium	mg/kg dry wt	*0.025*	0.16	0.23	0.20	0.45	0.23

Elements in Soil

		Client Sample ID	DUP A
		Date Sampled	
Analyte	Unit	*Reporting Limit*	21-18868-21
Aluminium*	mg/kg dry wt	*2.5*	11,400
Cobalt	mg/kg dry wt	*0.025*	9.39
Thallium	mg/kg dry wt	*0.025*	0.17

Method Summary

Elements in Soil Samples dried and passed through a 2 mm sieve followed by acid digestion and analysis by ICP-MS. In accordance with in-house procedure based on US EPA method 200.8.

Emily Hanna, B.Sc.
Trace Elements Team Leader

Analytica Laboratories Limited
Ruakura Research Centre
10 Bisley Road
Hamilton 3214, New Zealand
Ph +64 (07) 974 4740
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

EHS Support New Zealand Ltd
PO Box 15887
Auckland 0604

Attention: Andrew Rumsby
Phone: 0211020533
Email: andrew.rumsby@ehs-support.com

Sampling Site: Huntly Q

Lab Reference: 21-18868
Submitted by: JH
Date Received: 27/04/2021
Testing Initiated: 10/04/2021
Date Completed: 30/04/2021
Order Number: Huntly Q
Reference: Huntly Q

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Elements in Soil

			Client Sample ID	HA1 0-0.1	HA1 1.0	HA1 2.0	HA1 3.0	HA2 0-0.1
			Date Sampled					
Analyte	Unit	*Reporting Limit*		21-18868-1	21-18868-2	21-18868-3	21-18868-4	21-18868-5
Aluminium*	mg/kg dry wt	*2.5*		23,300	14,300	12,200	12,200	12,600
Cobalt	mg/kg dry wt	*0.025*		4.26	10.6	6.92	7.19	7.03
Thallium	mg/kg dry wt	*0.025*		0.28	0.19	0.16	0.16	0.13

Elements in Soil

			Client Sample ID	HA2 1.0	HA2 2.0	HA2 3.0	HA3 0-0.1	HA3 1.0
			Date Sampled					
Analyte	Unit	*Reporting Limit*		21-18868-6	21-18868-7	21-18868-8	21-18868-9	21-18868-10
Aluminium*	mg/kg dry wt	*2.5*		12,000	14,000	13,300	24,200	15,800
Cobalt	mg/kg dry wt	*0.025*		9.02	8.85	9.73	8.06	14.2
Thallium	mg/kg dry wt	*0.025*		0.16	0.16	0.18	0.18	0.32

Elements in Soil

			Client Sample ID	HA3 2.0	HA3 3.0	HA4 0-0.1	HA4 1.0	HA4 2.0
			Date Sampled					
Analyte	Unit	*Reporting Limit*		21-18868-11	21-18868-12	21-18868-13	21-18868-14	21-18868-15
Aluminium*	mg/kg dry wt	*2.5*		14,700	12,900	53,500	18,400	12,400
Cobalt	mg/kg dry wt	*0.025*		14.8	6.76	5.80	4.13	5.63

SPLP Extraction

		Client Sample ID	HA1 3.0	HA2 0.1	HA2 1.0	HA3 2.0	HA4 3.0
		Date Sampled	07/04/2021	07/04/2021	07/04/2021	07/04/2021	07/04/2021
Analyte	Unit	*Reporting Limit*	21-16875-1	21-16875-2	21-16875-3	21-16875-4	21-16875-5
Extractant Used			Reagent Water	Reagent Water	Reagent Water	Reagent Water	Reagent Water
Initial pH	pH	*1*	5.7	5.7	5.7	5.7	5.7
Final pH	pH	*1*	7.4	7.8	6.8	6.0	7.5

SPLP Extraction

		Client Sample ID	HA5 3.0
		Date Sampled	07/04/2021
Analyte	Unit	*Reporting Limit*	21-16875-6
Extractant Used			Reagent Water
Initial pH	pH	*1*	5.7
Final pH	pH	*1*	3.4

Method Summary

SPLP Elements SPLP extraction of soils followed by acid digestion and analysis of SPLP extracts by ICP-MS (In house procedure based on US EPA method 200.8).

SPLP Extraction SPLP was performed according to US EPA method 1312.

Emily Hanna, B.Sc.
Trace Elements Team Leader

Matthew Counsell, B.Sc.
Inorganics Team Leader

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	EHS Support New Zealand Limited	**Lab No:**	2579454	SPv3
Contact:	Andrew Rumsby	**Date Received:**	09-Apr-2021	
	C/- EHS Support New Zealand Limited	**Date Reported:**	03-May-2021	**(Amended)**
	PO Box 15887	**Quote No:**	92248	
	New Lynn	**Order No:**		
	Auckland 0604	**Client Reference:**		
		Submitted By:	Andrew Rumsby	

Sample Type: Soil

Sample Name:		BH301 - 1.0m 06-Apr-2021 10:00 am	BH301 - 1.5m 06-Apr-2021 10:00 am	BH301 - 3.0m 06-Apr-2021 10:00 am	BH301 - 6.0m 06-Apr-2021 10:00 am	BH301 - 8.7m 06-Apr-2021 10:00 am
Lab Number:		2579454.1	2579454.2	2579454.3	2579454.4	2579454.5
Individual Tests						
SPLP Sample Weight	g	50	50	50	50	50
SPLP Extractant Type*		De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4
SPLP Final pH	pH Units	9.0	9.3	8.1	8.9	9.6
Total Recoverable Aluminium	mg/kg dry wt	4,700	5,000	5,500	4,600	4,100
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	26	22	22
Total Recoverable Cobalt	mg/kg dry wt	3.1	5.7	6.7	5.5	8.3
Total Recoverable Thallium	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	2	< 2	< 2	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.10
Total Recoverable Chromium	mg/kg dry wt	5	6	7	5	5
Total Recoverable Copper	mg/kg dry wt	20	21	20	17	22
Total Recoverable Lead	mg/kg dry wt	19.1	16.1	17.2	15.0	15.8
Total Recoverable Nickel	mg/kg dry wt	3	8	6	7	7
Total Recoverable Zinc	mg/kg dry wt	66	59	55	54	84

Sample Name:		BH301 - 10.0m 06-Apr-2021 10:00 am	BH302 - 1.0m 06-Apr-2021 10:00 am	BH302 - 1.8m 06-Apr-2021 10:00 am	BH302 - 3.0m 06-Apr-2021 10:00 am	BH302 - 6.0m 06-Apr-2021 10:00 am
Lab Number:		2579454.6	2579454.7	2579454.8	2579454.9	2579454.10
Individual Tests						
SPLP Sample Weight	g	50	50	50	50	50
SPLP Extractant Type*		De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4
SPLP Final pH	pH Units	9.1	9.2	9.3	7.4	8.7
Total Recoverable Aluminium	mg/kg dry wt	6,700	4,300	4,900	11,000	6,300
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Total Recoverable Cobalt	mg/kg dry wt	2.1	19.3	9.1	11.0	12.2
Total Recoverable Thallium	mg/kg dry wt	0.2	< 0.2	< 0.2	0.2	< 0.2
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	6	12
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	5	5	6	5	6
Total Recoverable Copper	mg/kg dry wt	34	19	23	20	20
Total Recoverable Lead	mg/kg dry wt	20	22	17.7	17.3	17.8
Total Recoverable Nickel	mg/kg dry wt	3	15	9	7	10
Total Recoverable Zinc	mg/kg dry wt	83	91	86	50	92

Sample Type: Soil						
Sample Name:		BH302 - 7.6m 06-Apr-2021 10:00 am	BH302 - 10.0m 06-Apr-2021 10:00 am			
Lab Number:		2579454.11	2579454.12			
Individual Tests						
SPLP Sample Weight	g	50	50	-	-	-
SPLP Extractant Type*		De-ionised Water, pH 5.8 +/- 0.4	De-ionised Water, pH 5.8 +/- 0.4	-	-	-
SPLP Final pH	pH Units	8.7	9.1	-	-	-
Total Recoverable Aluminium	mg/kg dry wt	5,300	9,700	-	-	-
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	-	-	-
Total Recoverable Cobalt	mg/kg dry wt	1.0	9.6	-	-	-
Total Recoverable Thallium	mg/kg dry wt	< 0.2	< 0.2	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	13	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	5	9	-	-	-
Total Recoverable Copper	mg/kg dry wt	23	19	-	-	-
Total Recoverable Lead	mg/kg dry wt	11.7	23	-	-	-
Total Recoverable Nickel	mg/kg dry wt	< 2	9	-	-	-
Total Recoverable Zinc	mg/kg dry wt	15	55	-	-	-

Sample Type: Aqueous						
Sample Name:		BH301 - 1.0m [SPLP Extract]	BH301 - 1.5m [SPLP Extract]	BH301 - 3.0m [SPLP Extract]	BH301 - 6.0m [SPLP Extract]	BH301 - 8.7m [SPLP Extract]
Lab Number:		2579454.13	2579454.14	2579454.15	2579454.16	2579454.17
Individual Tests						
Total Aluminium	g/m^3	1.98	4.7	1.25	2.1	2.8
Total Boron	g/m^3	0.25	1.51	0.29	0.32	1.30
Total Cobalt	g/m^3	< 0.0042	< 0.0042	< 0.0042	< 0.0042	< 0.0042
Total Thallium	g/m^3	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m^3	< 0.021	< 0.021	< 0.021	< 0.021	< 0.021
Total Cadmium	g/m^3	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Total Chromium	g/m^3	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Total Copper	g/m^3	< 0.011	0.014	< 0.011	< 0.011	< 0.011
Total Lead	g/m^3	0.0088	0.0178	0.0049	0.0076	0.0096
Total Nickel	g/m^3	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Total Zinc	g/m^3	0.044	0.029	< 0.021	< 0.021	0.027

Sample Name:		BH301 - 10.0m [SPLP Extract]	BH302 - 1.0m [SPLP Extract]	BH302 - 1.8m [SPLP Extract]	BH302 - 3.0m [SPLP Extract]	BH302 - 6.0m [SPLP Extract]
Lab Number:		2579454.18	2579454.19	2579454.20	2579454.21	2579454.22
Individual Tests						
Total Aluminium	g/m^3	4.8	4.5	3.8	0.63	3.0
Total Boron	g/m^3	0.16	0.20	0.29	< 0.11	0.17
Total Cobalt	g/m^3	< 0.0042	< 0.0042	< 0.0042	0.0139	< 0.0042
Total Thallium	g/m^3	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m^3	< 0.021	< 0.021	< 0.021	< 0.021	< 0.021
Total Cadmium	g/m^3	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Total Chromium	g/m^3	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Total Copper	g/m^3	0.027	< 0.011	< 0.011	< 0.011	< 0.011
Total Lead	g/m^3	0.0098	0.0080	0.0043	< 0.0021	< 0.0021
Total Nickel	g/m^3	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Total Zinc	g/m^3	0.061	0.022	< 0.021	< 0.021	< 0.021

Sample Name:		BH302 - 7.6m [SPLP Extract]	BH302 - 10.0m [SPLP Extract]			
Lab Number:		2579454.23	2579454.24			

Sample Type: Aqueous						
Sample Name:		BH302 - 7.6m [SPLP Extract]	BH302 - 10.0m [SPLP Extract]			
Lab Number:		2579454.23	2579454.24			
Individual Tests						
Total Aluminium	g/m³	3.9	3.2	-	-	-
Total Boron	g/m³	< 0.11	0.13	-	-	-
Total Cobalt	g/m³	< 0.0042	< 0.0042	-	-	-
Total Thallium	g/m³	< 0.0011	< 0.0011	-	-	-
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.021	< 0.021	-	-	-
Total Cadmium	g/m³	< 0.0011	< 0.0011	-	-	-
Total Chromium	g/m³	< 0.011	< 0.011	-	-	-
Total Copper	g/m³	< 0.011	< 0.011	-	-	-
Total Lead	g/m³	0.0048	0.0039	-	-	-
Total Nickel	g/m³	< 0.011	< 0.011	-	-	-
Total Zinc	g/m³	< 0.021	< 0.021	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2579454-SPv2' issued on 27-Apr-2021 at 2:49 pm.
Reason for amendment: Additional testing added.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-12
Total Recoverable Aluminium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	10 mg/kg dry wt	1-12
Total Recoverable Boron	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	20 mg/kg dry wt	1-12
Total Recoverable Cobalt	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1-12
Total Recoverable Thallium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.2 mg/kg dry wt	1-12
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-12
SPLP Profile*	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1312.	-	1-12
SPLP Profile			
SPLP Sample Weight	Gravimetric. US EPA 1312.	0.1 g	1-12
SPLP Extractant Type*	US EPA 1312 (Modified for New Zealand conditions to use De-ionised Water unless otherwise specified).	-	1-12
SPLP Final pH	pH meter. US EPA 1312.	0.1 pH Units	1-12

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Total Digestion of Extracted Samples*	Nitric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	13-24
Total Aluminium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.063 g/m³	13-24
Total Boron	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.11 g/m³	13-24
Total Cobalt	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.0042 g/m³	13-24

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Thallium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.0011 g/m^3	13-24
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23rd ed. 2017.	0.0011 - 0.021 g/m^3	13-24

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 13-Apr-2021 and 03-May-2021. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental