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From: Lindsay Lutes
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Company: CMW Geosciences
SLR Consulting New Zealand Limited
cc:
Date: 12 August 2026
Project No. 810.031825.00001
RE: Brymer Development - Acid Sulphate Soils Investigation

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1.0 Introduction

CMW Geosciences (CMW) engaged SLR Consulting New Zealand Ltd (SLR) to undertake an Acid Sulphate Soil (ASS) investigation to support the substantive fast-track lodgement of the Brymer Farms Ltd residential development project (the Project). The Project is located in between Brymer Road, Rotokauri and Whatawhata Road, Hamilton, New Zealand (the site). Refer to **Figure 1** in **Attachment A** for the Project location and layout.

This technical memorandum summarises the scope, methodology, and outcomes of the ASS investigation completed to date.

This investigation provides an indicative assessment of ASS risk based on soil sampling from representative strata types likely to be disturbed during earthworks. It does not provide comprehensive spatial certainty across the entire Project area. The Acid Sulfate Soils Management Advisory Committee (ASSMAC) guidance notes that sampling frequency depends on project scale and risk rather than a fixed number of samples per hectare. The results of this assessment confirm that ASS management will be required, with most soils being low-risk and isolated horizons exhibiting moderate risk. Additional investigations may be warranted if unexpected conditions are encountered during construction.

1.1 Project Description

The Project is a comprehensively planned, multi-staged residential development providing for the urbanisation and subdivision of the Site. The Project is the subject of a Notice of Decision by the Minister, dated 4 September 2025, to refer the Project. It seeks the land use, environmental, subdivision and associated infrastructure consents required to enable the development to be delivered progressively and in a coordinated manner.

The Project will provide approximately 1,043 residential units, including approximately 248 apartment units, across a range of housing typologies and densities. Housing will comprise a mix of terraced, duplex and detached dwellings, conventional and compact residential lots, irregular lots, and eight larger rural-residential lots. This range of typologies is intended to provide housing choice while enabling the development pattern to respond appropriately to the physical characteristics, environmental features and constraints of the Site.

The Project master plan also provides for two mixed-use commercial sites, identified as C1 and C2, which will form a neighbourhood scale commercial component within the development. C1 will provide approximately 910 m² of ground-floor commercial gross floor area (GFA), with 24 two-bedroom apartments above. C2 will provide approximately 1,274 m² of ground-floor commercial GFA, with 16 two-bedroom apartments above. Both commercial

sites will incorporate basement car parking, dedicated vehicle access, servicing areas and landscaping. Collectively, C1 and C2 will provide approximately 2,184 m² of commercial GFA and 40 apartments, supporting the day-to-day needs of residents and contributing to a mixed-use neighbourhood environment.

The Project will be supported by the necessary transport and three-waters infrastructure. Water supply and wastewater servicing will connect to the IAWAI reticulated networks, with internal reticulation and associated infrastructure established progressively as the Project development is staged. This may include pump stations, storage, reservoirs and mains, where required. Stormwater will be managed through an integrated stormwater management system, with discharge ultimately occurring to the receiving environment within the Waikato District. The stormwater system will incorporate appropriate treatment, attenuation and conveyance measures and will integrate, where appropriate, with proposed wetlands, watercourses, stormwater reserves and other water-sensitive design features throughout the Project development.

Implementation of the Project will require staged development related earthworks to establish suitable building platforms, a well-connected road network, infrastructure corridors, reserves and other components of the master plan. These works will include Site formation, cut and fill, retaining, erosion and sediment control, and other enabling works required to facilitate the staged subdivision and development of the Site. The proposal will also require the undergrounding of existing power lines within the Applicant's site.

A significant component of the Project is the provision and enhancement of open space and ecological values. The development will provide an integrated network of public and recreational open spaces, pedestrian connections, wetlands, watercourses, stormwater reserves, landscaped areas and retained vegetation. Environmental and ecological mitigation and offsetting will also be provided where required to address effects arising from the Project development and to support the protection, restoration and enhancement of ecological values across the Site and wider receiving environment. Where appropriate, these measures will be integrated with the development's open-space and stormwater networks.

The overall open-space and movement network will connect with the surrounding urban environment and existing reserves, including Rakautahi Park, Brymer Glen Reserve, Brymer Park and Te Kootii Park. These connections will provide links between residential neighbourhoods, commercial and community areas, recreational spaces and the wider transport network.

Overall, the Project is a large scale, comprehensively planned urban development that will enable approximately 1,043 residential units, including approximately 248 apartments, together with approximately 2,184 m² of commercial GFA. The Project encompasses the subdivision and development of the land and the associated development related earthworks, transport and access infrastructure, water supply and wastewater connections to the IAWAI reticulated networks, stormwater management and discharge, ecological mitigation and offsetting, landscaping, open space, recreation, and other supporting infrastructure necessary to establish the new community.

The Project will be implemented through a multi-staged consenting and development framework, enabling subdivision, land use and infrastructure works to proceed progressively while ensuring that each stage is appropriately serviced and integrated with the wider development and surrounding environment.

The Project development will be subject to a comprehensive suite of proposed conditions of consent, including a design guide, developed with input from the Applicant's relevant technical and environmental specialists. These conditions will provide the framework for managing the construction, staging, servicing and operation of the development, including



earthworks, transport, three-waters infrastructure, stormwater discharges, ecological effects and offsetting, landscaping and open space, and other potential environmental effects associated with the Project.

Collectively, the master plan, supporting technical assessments and proposed conditions of consent provide an integrated framework for the staged delivery and management of the Project, including measures to avoid, remedy or mitigate adverse environmental effects and, where appropriate, provide environmental offsets.

2.0 Background

ASS are soils containing iron sulphides that can generate acidity when exposed to oxygen. These include Actual ASS (AASS), which are already acidic, and Potential ASS (PASS), which have not yet oxidised but may produce acidity upon disturbance.

The Waikato Regional Council (WRC) has mapped the probability of ASS occurrence across the region¹, identifying that the majority of the southern portion of the Project footprint lies within areas of high ASS probability. Several smaller areas show a negligible likelihood of ASS.

CMW Geosciences undertook a desktop study of the Project area, reviewing geological and geotechnical information to refine the areas of highest potential ASS risk. These high-risk areas are shown on **Figure 1**. This assessment informed the focus of the current investigation, which targeted high-risk areas in the low-lying areas of the site, identified by CMW.

3.0 Guidelines

This assessment has been undertaken with reference to procedures documented in the following guidelines:

- Stone Y, Ahern CR, and Blunden B (1998), *Acid Sulfate Soils Manual*. Acid Sulfate Soils Management and Advisory Committee (ASSMAC), Wollongbar NSW.
- Water Quality Australia (2018a), *National Acid Sulfate Soils Guidance, National Acid Sulfate Soils Identification and Laboratory Methods Manual* (June 2018).

4.0 Objectives

4.1 Technical

The objective of the investigation was to provide preliminary information to inform a site-specific acid sulfate soil management plan (ASSMP). Specifically, the investigation aimed to:

- Identify the presence or absence of AASS and/or PASS within the proposed development footprint through pH and chromium-reducible sulphur (CRS) analysis within areas mapped by WRC as having a potentially high likelihood of ASS.
- Identify areas where excavation, disturbance, or soil management activities may require ASS management / controls during construction to minimise potential risk posed from generation of sulphuric acid upon excavation.

¹ Waikato region acid sulfate soils preliminary risk assessment. Waikato Regional Council Technical Report 2023/24



- Provide recommendations on management considerations for incorporation into the site-specific ASSMP to ensure pre-emptive compliance with WRC consent conditions and to prevent acid drainage or off-site impacts.

4.2 Administrative

The investigation was commissioned to pre-emptively satisfy the pre-construction site investigation requirements under WRC resource consents, which would require characterisation of the ASS status of subsurface soils. The results of this investigation will inform a site-specific ASSMP to support earthworks within these potentially high-risk areas.

5.0 Scope of Works

SLR undertook an ASS investigation to characterise the presence and properties of potential ASS at targeted locations across the site, specifically locations identified as high-risk by WRC ASS probability maps. The scope of work included:

- Advancement of three soil cores using manual hand auger across targeted areas of the site to obtain subsurface soil samples (ID: SS45, SS46 and SS47).
- Field screening of samples using field pH (pH_F) and field oxidised pH (pH_{FOX}) peroxide testing.
- Confirmatory laboratory analysis for selected soils using the CRS suite to identify any AASS or PASS, determine self-buffering capacity of soil and ascertain net acidity.
- Assessment of results in accordance with New Zealand best-practice guidance for ASS investigations and pre-emptively satisfy consenting requirements of WRC.
- Preparation of this technical memorandum summarising the investigation findings and their implications for Project development.

6.0 Sulfidic Hazard Classes & Acid-Base Accounting

Soil hazard classes for the management of ASS are used to assist with the interpretation of the potential environmental impact of soil acidification as a result of reduced inorganic sulfide (RIS or S) oxidation.

These soil hazard classes refer to procedures in the Acid Sulfate Soils Management Advisory Committee (ASSMAC) guidelines (Stone *et al* 1998) (refer to **Table 1**).

The soil hazard classes are based on the soil sulphur (S) and net acidity (NA) values. Classes normally used are no risk (no-sulphur or non-reactive), moderate risk and high risk. An explanation of these classes is presented in the following subsections. NA is calculated based on the acid-base account (ABA) of the soil being analysed:

- $NA = \text{Total potential acidity (TPA)} + \text{Existing acidity (CRS)} - \text{Acid neutralising capacity (ANC)}$.
- $\text{Existing acidity (CRS)} = \text{Titrateable actual acidity (TAA)} + \text{Retained acidity (S}_{NAS}) \times \text{TPA}$.

Hence, the final equation is:

$$NA = CRS + TAA + S_{NAS} - ANC$$

The Sulphide Hazard Class (SHC) in kg sulphuric acid (H_2SO_4) per tonne is expressed by converting the %S threshold values into the equivalent amount of H_2SO_4 produced if all sulphide oxidises. This comes from atomic mass relationship:



1% S = 10 kg S per tonne → × 3.06 = 30.6 kg H₂SO₄

- SHC1 / low-no hazard threshold corresponds to:
 - < 0.03 %S
 - < 0.918 kg H₂SO₄ / tonne.
- SHC2 / moderate hazard threshold corresponds to:
 - 0.03 -0.75 %S
 - 0.918 – 22.95 kg H₂SO₄ / tonne.
- SHC3 / high hazard threshold corresponds to:
 - > 0.75 %S
 - > 22.95 kg H₂SO₄ / tonne.



Table 1: Sulphide Hazard Class Determination

Soil Texture Group	No Risk (SHC1)				Risk			
	No – Sulphur (SHC1)		Non – reactive (SHC1)		Moderate Risk (SHC2)		High Risk (SHC3)	
	Sulphur	NA	Sulphur	NA	Sulphur	NA	Sulphur	NA
Sands	<1	---	>1	<3	>1	>3	>10	>5
Sandy Silts & Silts	<2	---	>2	<6	>2	>6	>20	>10
Clays	<3	---	>3	<9	>3	>9	>30	>15
Notes: NA Net acidity SHC Sulfide hazard class H ₂ SO ₄ Sulphuric acid With the exception of the 'no sulphur' category, samples require both Sulphur & NA values to define hazard classes. CRS = Actual S x 30.6 (conversion to H ₂ SO ₄ per tonne of soil equivalent) All units are in kg H ₂ SO ₄ / tonne								

6.1 No Risk (No-Sulphur / Non-reactive)

The non-reactive category (SHC1) is based on NA and is defined as having a CRS value greater than the no-sulphur threshold and a NA value below three times that of the no-sulphur value in **Table 1**. These levels are based on SLR's experience with ASS and require calibration using accelerated weathering trials (AWTs) to define the exact value, because soil variation can cause significant deviation from the anticipated value.

6.2 Moderate and High Risk

Moderate (SHC2) and high-risk (SHC3) sulfidic sediment and soil is likely to cause a significant adverse risk to the environment. Essentially, moderate risk will generate a small amount of acid slowly while high risk will either generate acid quickly and/or in large volumes.

If possible, high-risk soil/sediment should not be disturbed. If disturbance cannot be avoided, high risk soil/sediment is recommended to be kept in an anoxic state. Risk categories for soil samples collected from the site, based on the hazard classes is detailed in **Table 1**.

6.3 Action Criteria

The action criteria in **Table 2** that trigger the need to prepare an ASS management plan are grouped by three broad soil texture categories – coarse, medium and fine. If the Net Acidity of any individual soil material tested is equal to or greater than the action criterion, a detailed ASS management will need to be prepared (WQA, 2018).

However, it is important to note the acidity hazard of soil materials that are strongly acidic due to processes other than RIS oxidation, are not considered an ASS acidity hazard. Actual ASS are acid soil materials, but not all acid soil materials are Actual ASS. Naturally occurring acidic soils are not uncommon and are not considered an environmental hazard that require management to change their acidity. Indeed, these naturally occurring acidic soils are usually part of acidophilic ecosystems whose health depends on maintaining the acidic environment.



Accordingly, the trigger values in **Table 2** apply only to ASS materials and not to other acidic soils. As an example, many soil materials in naturally acidic landscapes, such as acidic peatlands and coastal heaths, often have NA's exceeding the action criteria in **Table 2**.

Table 2: Action Criteria

Material Type	Approx Clay Content	Net Acidity #			
		1 – 1,000 Tonnes Material Disturbed		> 1,000 Tonnes Material Disturbed	
		% S-equiv. (oven-dried basis)	mol H+/t (oven-dried basis)	% S-equiv. (oven-dried basis)	mol H+/t (oven-dried basis)
Fine: Light medium to heavy clays	> 40	≥ 0.10	≥ 62	≥ 0.03	≥ 18
Medium: Clayey sand to light clays	5 – 40	≥ 0.06	≥ 36	≥ 0.03	≥ 18
Coarse and Peats: Sands to loamy sands	< 5	≥ 0.03	≥ 18	≥ 0.03	≥ 18
Notes: If bulk density values are not available for the conversion of cubic meters to tonnes of soil, then the default bulk densities based on the soil texture may be used. # Net Acidity can only include a soil material's measured Acid Neutralising Capacity where this measure has been corroborated by other data					

7.0 Site Investigation

7.1 Sampling Methodology

The ASS investigation was undertaken on 18 November 2025 by SLR Consulting, targeting high-risk areas identified from the WRC ASS probability map and refined through the desktop study completed by CMW Geosciences (**Figure 1**). A total of three hand auger locations (SS45 – SS47, inclusive) were advanced across the development footprint to provide representative coverage, with additional focus on areas of potential elevated ASS risk.

Soil samples were collected at 0.25 m intervals to a maximum depth of 2.0 metres below ground level (m bgl) at each hand auger location. In addition to this, field screening was undertaken every 0.25 m bgl to determine soil pH_F and pH_{FOX}, providing an initial assessment for the presence of reduced inorganic sulphur.

Two samples from each location (total of 6) were submitted to the laboratory for analysis of the CRS suite. Soil sampling and analysis were completed in general accordance with:

- SLR Standard Operating Procedure (SOP) 2.1 - Soil Sampling, October 2018, and
- Ministry for the Environment Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils (1999, revised 2021).

All samples were collected by suitably trained SLR personnel using clean sampling techniques, placed in laboratory-supplied containers, and transported under chain-of-



custody to ALS Global New Zealand for analysis. Sampling locations are shown in **Figure 1**, with details summarised in **Table 3**.

7.2 Sampling Observations

At each location soil temperature, qualitative reaction intensity, soil texture, and moisture condition was measured at 0.25 m intervals alongside pH_F and peroxide pH_{FOX} . Selected samples were collected for laboratory analysis where field screening results or soil conditions indicated potential ASS risk. All field observations including depth, soil classification, pH measurements, reactions, and sample collection points are summarised in **Table 3**.

Across the Project area, soils generally comprised pumiceous silty sands, clayey silts, silty clays, silts, and peat. Moisture conditions ranged from moist to wet, consistent with the season and soil types encountered.

The soil log details and soil profile photographs are presented in **Attachment B**.

7.3 pH Field Results Summary

Overall, the field sampling pH_F and peroxide pH_{FOX} dataset indicates predominantly minor to low acid generation potential:

- 68% of field samples exceeded the threshold of $\Delta\text{pH} > 1.0$. These elevated ΔpH values were generally associated with silty or organic-enriched materials.
- 4% of field samples exhibited positive (or none) ΔpH values between 0.0 and 0.6 (SS45 at 0.5 m bgl).

Field results indicate that acidity potential across the Project area is a potentially widespread risk. Most shallow soils (0 - 0.5 m bgl) indicated low acidity potential, while isolated mid-profile layers underlying indicated moderate to high potential acidity. The presence of organic-rich horizons correlated with the most extreme ΔpH values consistent with typical PASS behaviour.

7.4 CRS Sample Selection

A total of six samples (two from each hand auger location) were submitted for analysis of the CRS suite based on the following considerations:

- Most significant pH decreases.
- Notable oxidation reactions.
- Higher organic content.
- Soil textures typically associated with ASS (e.g., fine-grained silts and clays).



Table 3: Field Oxidation Testing Results Summary

Sample ID	Depth (m bgl)	pH _F	pH _{FOX}	Temp (°C)	Reaction	ΔpH	Material	Moisture	Sample Collected	CRS Analysis
SS45	0.25	5.38	4.57	18.6	Minor	-0.81	Clayey SILT	Moist	Yes	Hold Cold
	0.50	5.37	4.74	16.6	Minor	-0.63	Silty CLAY	Moist	Yes	Hold Cold
	0.75	5.65	4.81	17.7	Minor	-0.84	Silty CLAY	Moist	Yes	Hold Cold
	1.00	5.34	4.57	15.6	Minor	-0.77	Sand	Moist	Yes	Hold Cold
	1.25	5.32	4.52	17.9	Minor	-0.8	Silty SAND	Moist	Yes	Hold Cold
	1.50	5.43	4.01	14.7	Medium	-1.42	Sandy SILT	Moist	Yes	Yes
	1.75	5.61	3.72	18.3	Medium	-1.89	SILT	Wet	Yes	Hold Cold
	2.00	6.38	3.32	20.9	Medium	-3.06	SILT	Wet	Yes	Yes
SS46	0.25	4.44	3.75	19.6	Minor	-0.69	Clayey SILT	Moist	Yes	Hold Cold
	0.50	4.93	3.81	19.6	Minor	-1.12	Peat	Moist	Yes	Hold Cold
	0.75	5.4	3.66	19.5	Medium	-1.74	Peat	Moist	Yes	Yes
	1.00	5.16	3.46	19.5	Medium	-1.7	Peat	Wet	Yes	Hold Cold
	1.25	5.47	3.66	19.5	Medium	-1.81	Peat	Wet	Yes	Hold Cold
	1.50	5.49	2.79	20.3	Medium	-2.7	Peat	Wet	Yes	Hold Cold
	1.75 – 2.00	5.23	2.54	20.4	Medium	-2.69	Peat	Wet	Yes	Yes
SS47	0.25	4.78	3.59	19.7	Medium	-1.19	Clayey SILT	Moist	Yes	Yes
	0.50	4.37	3.6	19.6	Minor	-0.77	Peat	Moist	Yes	Hold Cold
	0.75	4.87	3.87	20.4	Minor	-1	Peat	Moist	Yes	Hold Cold
	1.00	5.4	2.97	18.1	Medium	-2.43	SILT and peat	Wet	Yes	Yes
	1.25	5.25	3.9	18.1	Medium	-1.35	SILT	Wet	Yes	Hold Cold
	1.50	5.76	4.18	18.8	Medium	-1.58	SILT	Wet	Yes	Hold Cold
	1.75 – 2.00	5.92	4.64	19.4	Medium	-1.28	SILT	Wet	Yes	Hold Cold

Notes:

Highlighted cell = sample CRS analysed



7.5 Laboratory Results

Laboratory analysis of selected soil samples was undertaken to confirm the presence and magnitude of potential or actual acidity indicated during field screening. CRS testing was completed to quantify reduced inorganic sulphur content and to calculate corresponding acidity, net acidity, and indicative liming rates. The results provide the basis for determining ASS risk categories across the sampled profile and for informing appropriate management measures within a site-specific ASSMP. The CRS results are summarised in **Table 4** and the laboratory certificates are presented in **Attachment C**.



Table 4: Suggested Liming Rate / Risk Category

Sample ID	Depth (m bgl)	Material	Sulphur (%S)	Sulphur (kg/H ₂ SO ₄ /T)	Net Acidity (%S)	Net Acidity (mole H ⁺ /t)	Net Acidity (kg/H ₂ SO ₄ /T)	Liming Rate (kg/CaCO ₃ /T)	Risk Category
SS45	1.50	Sandy SILT	0.02	0.612	0.06	38	1.836	3	SHC1: No risk / No sulphur
	2.00	SILT	0.07	2.142	0.10	63	3.060	5	SHC1: No risk / Non-reactive
SS46	0.75	PEAT**	0.14	4.284	0.16	98	4.896	7	SHC1: No risk / Non-reactive
	1.75 - 2.00	PEAT**	0.13	3.978	0.15	96	4.590	7	SHC1: No risk / Non-reactive
SS47	0.25	Clayey SILT	0.17	5.202	0.27	168	8.262	13	SHC2: Moderate Risk
	1.00	SILT and PEAT**	0.05	1.530	0.07	46	2.142	3	SHC1: No risk / Non-reactive

Notes:

%S Percentage sulphur
Kg/H₂SO₄/t Kilograms of sulphuric acid per tonne
Kg/CaCO₃/t Kilograms of calcium carbonate per tonne
Mole H⁺/t Moles of hydrogen ions per tonne
SHC Sulphide hazard classification
** Peat/organic soils are typically classified as silts unless local conventions mandate grouping them strictly as clays



8.0 Discussion

The hand auger investigation across the Site has provided a preliminary site-specific assessment for ASS occurrence, acidity potential and implications for earthworks management. Key findings and considerations are summarised below:

- **Soil Types and Depth Profiles:** Sandy silt, silt, clayey silt, mixed silt and peat, and peat units were encountered between 0.25 – 2.00 m bgl across the sampled locations (SS45 – SS47, inclusive). These materials include isolated organic-enriched soil horizons (peat and mixed silt and peat) as well as predominantly mineral silts.
- **Field pH Assessment:**
 - Field screening using pH_F and pH_{FOX} indicated variable acidity potential across the sampled horizons.
 - ΔpH values ranged from -0.63 to -3.06, with the strongest reactions observed in SS45 (2.00 m, silt; $\Delta\text{pH} = -3.06$) and SS46 (1.75 – 2.00 m, peat; $\Delta\text{pH} = -2.69$), with medium reaction observed in both.
 - Most ΔpH values (68% of all field samples at all three locations) exceeded the threshold of $\Delta\text{pH} > 1.0$, associated with isolated silty or organic-enriched horizons, where a small portion of ΔpH (32%) was reported between pH -0.6 and -1.0.
 - Positive or negligible ΔpH values (4%) suggest non-acidic soils in shallow soil horizons.
- **Laboratory CRS Results:**
 - CRS analysis confirmed low to moderate sulphur content across all tested samples, reporting $\text{NA} > \text{Action Criteria of } 18 \text{ moles H}^+/\text{t} / 0.03 \% \text{S}$ for management of >1,000 tonnes of disturbed material.
 - Results indicated that:
 - One of the six samples tested met the criteria for AASS or moderate risk of PASS (SS47 clayey silt at 0.25 m) and accordingly categorised as SH2- Moderate Risk, with consideration to sulphur and net acidity content over respective texture grades in accordance with SHC determination (refer to **Table 5**).
 - Remaining samples analysed were categorised as either SHC1 – No sulfur, or SH1 – No risk / Non-reactive.
 - Despite the SHC1 (No Risk) designation, laboratory analysis prescribes positive verification liming rates (ranging from 3 - 13 kg $\text{CaCO}_3/\text{tonne}$). This requirement is not driven by a pyritic hazard, but likely from residual background acidity. While these soils will not generate fresh acid via oxidation of pyrites, the existing acid load within the sandy silt, clay, and peat matrices is likely mobile. Excavation and stockpiling will trigger immediate leaching of this legacy acid into local groundwater or surface water systems if left untreated.
 - One exception was sample SS47 (0.25 m bgl) situated within clayey silt which reported a suggested liming rate of 13 kg CaCO_3/t , with acidity driven by sulfidic source.



- Calculated liming rates are consistent with the moderate ΔpH values and CRS content observed.
- **Spatial Distribution of ASS Risk:**
 - Reactive clayey soil horizons were determined to pose a moderate (SS47 at 0.25m).
 - Non-reactive conditions were encountered at all other locations / depths associated with the mineral silts (SS45) and deeper mixed silts / peats (SS46 and SS47).
 - Relatively high NA values reported with SH1 hazard classes over a range of locations / materials were not driven by a pyritic hazard, but likely from residual background acidity.
 - The combination of variable CRS values, ΔpH reactions, and occurrence of reactive materials indicates a potential for acid generation, requiring appropriate management during disturbance.
- **Implications for Earthworks:**
 - Although most soils analysed were characterised as No Sulphur, or No risk / Non-reactive, reported values for NA will still required management, especially where larger soil volumes will be disturbed (>1,000 tonnes).
 - While most soils will not generate fresh acid via oxidation due to pyrite content, there is existing acid load within the sandy silt, clay, and peat matrices that could mobilise. Excavation and stockpiling will trigger immediate leaching of this legacy acid into local groundwater or surface water systems if left untreated.
 - With the overall risk of encountering high-acidity materials being low, the combination of moderate acidity potential, low natural buffering capacity, and the large soil volumes to be disturbed means that management will still be required (WQA, 2018a).
 - Standard ASSMP controls including staged excavation, keeping reactive materials moist, visual/olfactory screening for sulphide odours, and application of lime at calculated rates, are considered sufficient for risk reduction.

9.0 Conclusion

Based on the observations and analytical results obtained during this ASS investigation, the following conclusions are made:

- ASS indicators were identified across the Site; however, only one laboratory sample (SS47, 0.25 m bgl clayey silt) met the criteria for AASS or moderate-risk PASS and was classified as SH2 – Moderate Risk.
- Soil profiles comprise sandy silt, silt, clayey silt, mixed silt and peat, and peat horizons between 0.25 m and 2.00 m bgl. Reactive conditions were limited to an isolated shallow clayey silt horizon, with all other tested materials classified as SHC1 – No Sulphur or SH1 – No Risk / Non-Reactive.
- Field pHF and pHFOX testing recorded moderate to strong acidity responses, with 68% of samples reporting $\Delta\text{pH} > 1.0$. CRS analysis confirmed generally low to moderate sulphur concentrations, with only one sample exhibiting a significant sulphidic acidity hazard.



- Positive net acidity values were reported across most laboratory samples, resulting in calculated liming rates of approximately 3-13 kg CaCO₃/t. In most cases, these rates reflect existing background acidity rather than a pyritic acid-generation hazard.
- Although most soils are not expected to generate new acidity through sulphide oxidation, existing acidity within sandy silt, clayey silt and organic-rich soils may become mobilised during excavation, stockpiling, and dewatering, requiring management to protect receiving environments.
- Given the limited extent of reactive material, generally low sulphur contents, and moderate lime demand, the overall ASS risk at the Site is assessed as low to moderate, provided appropriate management measures are implemented.
- Earthworks can be effectively managed through a site-specific ASSMP incorporating staged excavation, moisture control, field screening for potentially reactive materials, lime treatment at calculated rates, and environmental monitoring. No additional laboratory testing is considered necessary at this stage.

10.0 Recommendations

Overall, management will be required due to the scale of earthworks and low natural buffering capacity; however, the lime requirements are relatively low, and implementation through the ASSMP during earthworks is considered appropriate and sufficient. The findings provide the necessary site-specific basis for an ASSMP.

11.0 Closure

Should you have any questions on the contents of this technical memorandum, please do not hesitate to contact the undersigned.

Regards,

SLR Consulting New Zealand Limited



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Chris Newland
Principal Consultant
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12.0 References

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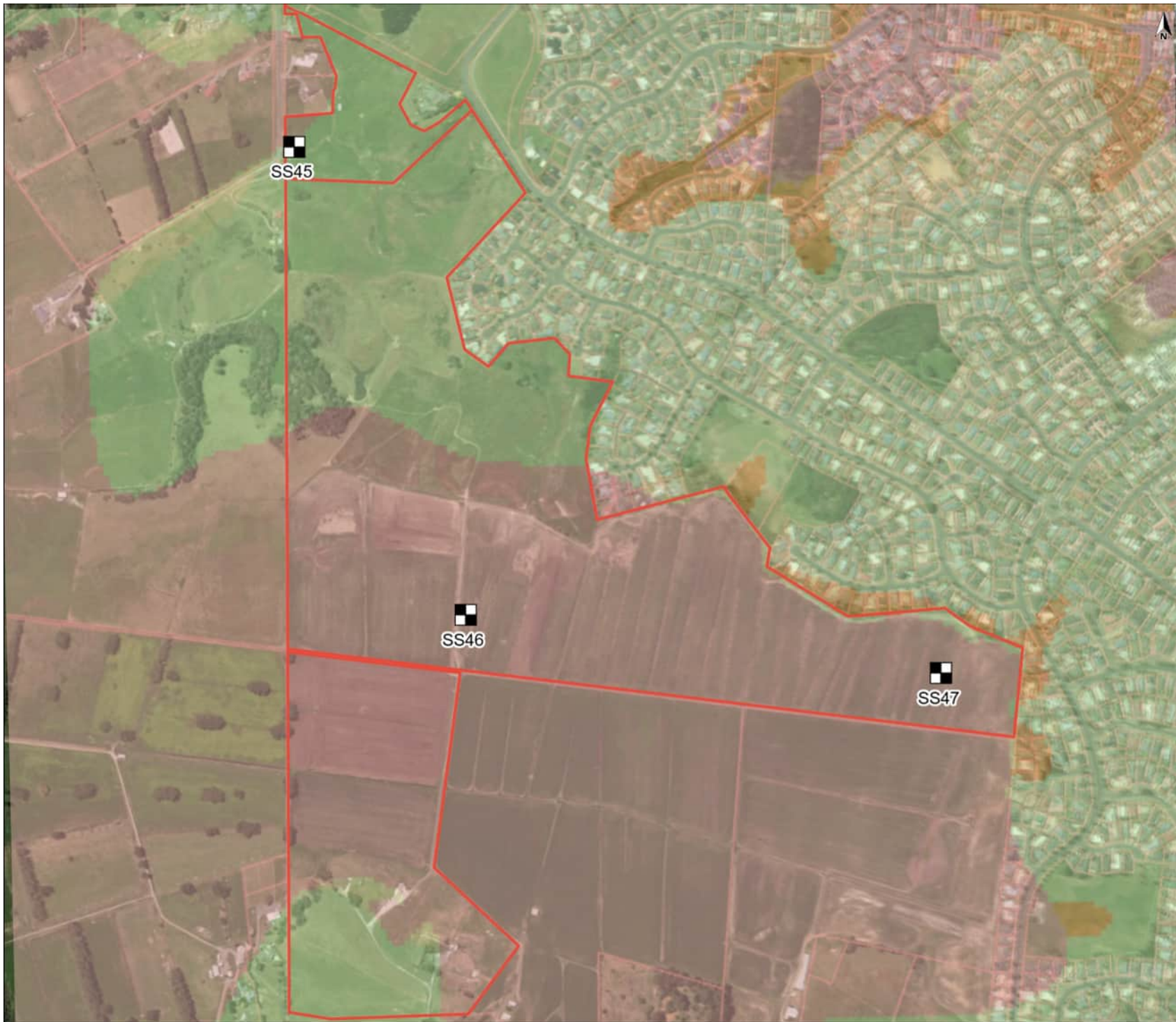
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- Legend**
- Low Risk
 - Medium Risk
 - High Risk
 - Sample Locations
 - Site Boundary
 - ASS Probability Map

0 100 m 200 m
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Title: Acid Sulphate Soil Investigation - Sample Locations		
Client: CMW Geosciences		Size: A4
Project: Brymer Development DSI	Drawn: LL	Figure No.: 1
Date: 10-11-2025	Checked: NM	
Proj No: 810.031825.00001	Scale: 1:9100	Version: 1.0

Attachment B – Soil Log and Investigation Photographs



UTM : 60H	Driller Rig :	Job Number : 810.031825.00001
Latitude : -37.77939	Driller Supplier :	Client : CMW Geosciences
Longitude : 175.21518	Logged By : Sandra Hamler	Project : Brymer Development DSI
Elevation : Not Surveyed	Reviewed By : Lindsay Lutes	Location : Brymer Road, Grandview Heights, Hamilton, New Zealand
Total Depth : 2 m	Date : 06/01/2026	Loc Comment :

PID (ppm)	Sample	Moisture	Water Level	Depth (m)	Graphic Log	LITHOLOGICAL DESCRIPTION	COMMENTS / CONTAMINANT INDICATORS	Well Diagram	Elevation (m)
		M		0.1		TOPSOIL Clayey SILT, dark brown, medium plasticity, moist, soft			
		M		0.2		Clayey SILT, brown, medium plasticity, moist, soft			
		M		0.3					
		M		0.4					
		M		0.5		Silty CLAY, brown, medium plasticity, moist, firm			
		M		0.6					
		M		0.7					
		M		0.8					
		M		0.9					
		M		1.0		SAND, brown, well graded, moist			
		M		1.1					
		M		1.2					
		M		1.3		Sandy SILT, brown, low plasticity, moist, firm			
		M		1.4					
		M		1.5					
		W		1.6		SILT, light brown, low plasticity, wet, firm			
		W		1.7					
		W		1.8					
		W		1.9					
						Target depth was reached at 2 m.			

UTM : 60H	Driller Rig :	Job Number : 810.031825.00001
Latitude : -37.78666	Driller Supplier :	Client : CMW Geosciences
Longitude : 175.21855	Logged By : Sandra Hamler	Project : Brymer Development DSI
Elevation : Not Surveyed	Reviewed By : Lindsay Lutes	Location : Brymer Road, Grandview Heights, Hamilton, New Zealand
Total Depth : 2 m	Date : 06/01/2026	Loc Comment :

PID (ppm)	Sample	Moisture	Water Level	Depth (m)	Graphic Log	LITHOLOGICAL DESCRIPTION	COMMENTS / CONTAMINANT INDICATORS	Well Diagram	Elevation (m)
		M		0.1		TOPSOIL Clayey SILT, dark brown, medium plasticity, moist, firm			
		M		0.2		Clayey SILT, brown, low plasticity, moist, firm			
				0.3		PEAT, grey mottled black, moist			
				0.4					
				0.5					
				0.6					
				0.7					
				0.8					
				0.9					
				1.0					
		M	1.00 m	1.1					
				1.2					
				1.3					
				1.4					
				1.5					
				1.6					
				1.7					
				1.8					
				1.9					
						Target depth was reached at 2 m.			

UTM : 60H	Driller Rig :	Job Number : 810.031825.00001
Latitude : -37.78756	Driller Supplier :	Client : CMW Geosciences
Longitude : 175.22788	Logged By : Sandra Hamler	Project : Brymer Development DSI
Elevation : Not Surveyed	Reviewed By : Lindsay Lutes	Location : Brymer Road, Grandview Heights, Hamilton, New Zealand
Total Depth : 2 m	Date : 06/01/2026	Loc Comment :

PID (ppm)	Sample	Moisture	Water Level	Depth (m)	Graphic Log	LITHOLOGICAL DESCRIPTION	COMMENTS / CONTAMINANT INDICATORS	Well Diagram	Elevation (m)
		M		0.1		TOPSOIL Clayey SILT, dark brown, medium plasticity, moist, soft			
		M		0.2		Clayey SILT, brown, medium plasticity, moist, soft			
		M		0.3					
		M		0.4					
		M		0.5		PEAT, grey mottled black, moist			
		M		0.6					
		M		0.7					
		M		0.8					
		M		0.9					
		W	1.00 m	1.0		Organic SILT, brown mottled black, low plasticity, wet, soft			
		W		1.1					
		W		1.2					
		W		1.3		SILT, light brown, low plasticity, wet, soft			
		W		1.4					
		W		1.5					
		W		1.6					
		W		1.7					
		W		1.8					
		W		1.9					
						Target depth was reached at 2 m.			

Photolog

Photo 1: SS45 – Soil profile (18 November 2025). 	Photo 2: SS45 – Soil profile (18 November 2025). 	Photo 3: SS45 – Soil profile (18 November 2025). 
Photo 4: SS45 – Sample location (18 November 2025). 	Photo 5: SS45 – Reaction at depth 0.75 m bgl (18 November 2025). 	Photo 6: SS46 – Soil profile (18 November 2025). 



Photo 7: SS46 – Reaction at depth 0.25 m bgl (18 November 2025).	Photo 8: SS46 – Reaction at depth 0.5 m bgl (18 November 2025).	Photo 9: SS47 – Soil profile (18 November 2025).
		
Photo 10: SS47 – Soil profile (18 November 2025).	Photo 11: SS47 – Soil profile (18 November 2025).	Photo 12: SS47 – Sample location (18 November 2025).
		



Attachment C – Laboratory Certificates





CERTIFICATE OF ANALYSIS

Work Order : NH2502329

Client : **SLR CONSULTING NEW ZEALAND LIMITED**
Contact : Lindsay Lutes
Address : 201 Victoria Street West
Auckland Auckland New Zealand 1010
Telephone : ----
Project : 810.031825
Order number : ----
C-O-C number : ----
Sampler : Sandra Hamler
Site : Brymer
Quote number : EN/111
No. of samples received : 22
No. of samples analysed : 6

Laboratory : Environmental Hamilton
Contact : Prianshu Chawla
Address : Ruakura Research Centre, 10 Bisley Rd
Hamilton WKO New Zealand 3214
Telephone : +64 7 974 4740
Date Samples Received : 19-Nov-2025 07:15
Date Analysis Commenced : 20-Nov-2025
Issue Date : 11-Dec-2025 12:40



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below.

Signatories	Position	Accreditation Category
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



General Comments

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key: CAS Number: CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR: Limit of Reporting (detection limit).

Unit	Description
-	No Unit
% pyrite S	% pyrite Sulfur
% S	% Sulfur
kg CaCO3/t	kg CaCO3 per tonne
mole H+ / t	H+ / tonne
pH Unit	pH Unit

>: greater than.

<: less than.

ø: ALS is not IANZ accredited for these tests.

^: This result is computed from individual analyte detections at or above the level of reporting.

~: Indicates an estimated value.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

Samples were collected by yourselves (or your agent) and analysed as received at ALS NZ (or at the subcontracted laboratories, when applicable). Samples were in acceptable condition unless otherwise noted on this report.

ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5



Analytical Results

Sub-Matrix: SOIL

(Matrix: SOIL)

				Client Sample ID	SS45 1.5 ----	SS45 2.0 ----	SS46 0.75 ----	SS46 1.75-2.0 ----	SS47 0.25 ----
				Client Sampling date / time	18-Nov-2025 00:00	18-Nov-2025 00:00	18-Nov-2025 00:00	18-Nov-2025 00:00	18-Nov-2025 00:00
Compound	CAS Number	LOR	Unit		NH2502329-006	NH2502329-008	NH2502329-011	NH2502329-015	NH2502329-016
					Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		4.4	4.2	3.8	3.9	4.2
Titrateable Actual Acidity (23F)	----	2	mole H+ / t		15	42	87	84	106
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S		0.02	0.07	0.14	0.13	0.17
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		0.037	0.034	0.017	0.019	0.035
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		23	21	11	12	22
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
HCl Extractable Sulfur (20Be)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	0.04
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	0.09
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	<10	<10	<10	41
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	0.06
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.06	0.10	0.16	0.15	0.27
Net Acidity (acidity units)	----	10	mole H+ / t		38	63	98	96	168
Liming Rate	----	1	kg CaCO3/t		3	5	7	7	13
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.06	0.10	0.16	0.15	0.27
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		38	63	98	96	168
Liming Rate excluding ANC	----	1	kg CaCO3/t		3	5	7	7	13



Analytical Results

Sub-Matrix: SOIL

(Matrix: SOIL)

			Client Sample ID	SS47 1.0				
			Client Sampling date / time	18-Nov-2025 00:00				
Compound	CAS Number	LOR	Unit	NH2502329-019				
				Result				
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.3	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	31	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.05	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.024	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	15	----	----	----	----
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	0.07	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	46	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	3	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.07	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	46	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	3	----	----	----	----



Brief Method Summaries

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.