

Active Water Treatment Testing Report

Summary of Water Quality Testing

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EXECUTIVE SUMMARY

Process Flow Limited (PFL) has developed this report on water quality testing to determine treatment requirements for mine influenced water associated with the proposed Buller Plateaux Continuation Project (BPCP). Bathurst Resources Limited (BRL) is seeking to obtain authorisation through the Fast Track Approvals Act (FTA) to progress development and mining of the coal resources across the wider Buller Plateaux.

The purpose of the BPCP is to re-consent the existing infrastructure and mining operations associated with the existing Stockton Mine and provide access to additional coal mining areas across the Buller Plateaux and, as the coal resources in the current Stockton mine are close to depletion, develop further coal resources for on-going blending with the Stockton coal.

This report summarises the water quality and treatment optimisation testing carried out by Process Flow Limited in 2024/2025. The purpose of this work was to inform the water treatment plant design process to ensure treated water outputs could achieve guidelines limits provided by Hickey (2026).

Specifically, the scope of work for Process Flow Limited (PFL) included.

- MIW (Mine Influenced Water) Jar and Settlement testing to inform process selection, chemical selection and process sizing. (*This report*)
- Develop a Basis of Design for two active water treatment plants (*See PFL-2408-PRJ-BOD-00001 Active WTP – Basis of Design*)

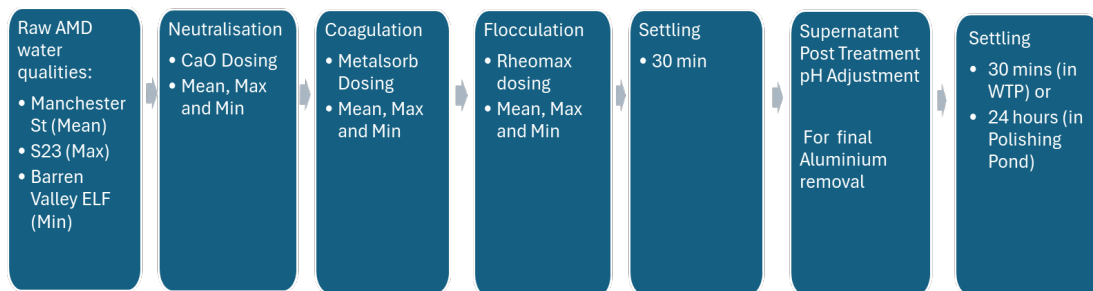
Water quality from the proposed treatment processes is required to meet the water quality guidelines for site discharge. (*Guideline, Hickey 2026*).

This report is a summary of the testing carried out, for detailed results, methodologies, laboratory test reports and conclusions, reference should be made to the following documents. These are listed as appendices to this report and are as follows:

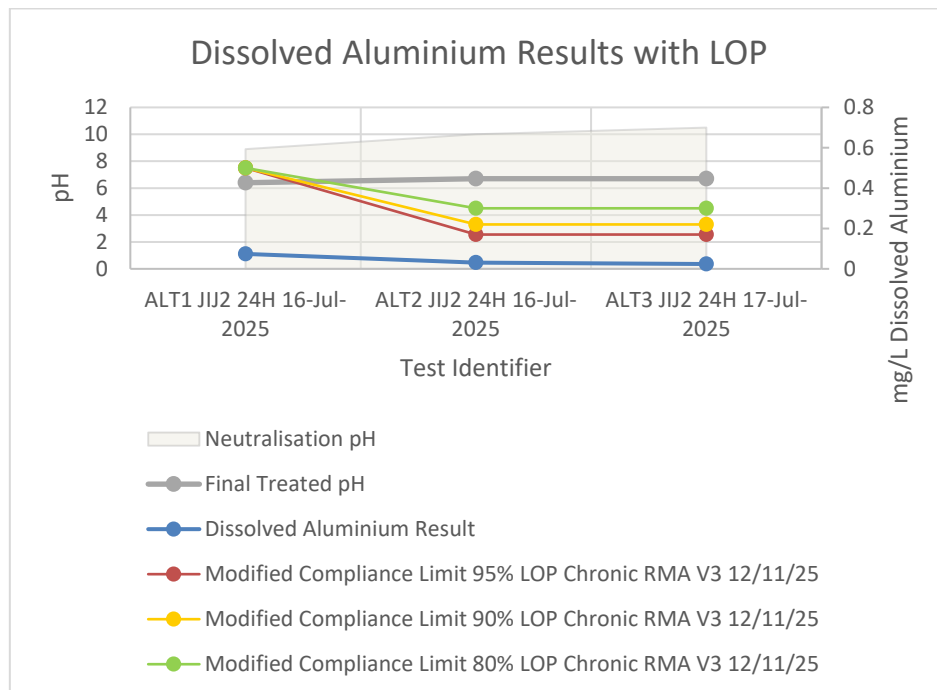
- Appendix A – Bench and Column Water Treatment Tests
- Appendix B – Supernatant Quality Tests
- Appendix C – Sludge Characterisation Tests
- Appendix D – Sludge Thickening and Dewatering Tests
- Appendix E – High Density Sludge Process Tests
- Appendix F – Chemical Makeup Water Tests
- Appendix G – MgO Tests
- Appendix H – WTP Bypass Water Neutralisation Tests
- Appendix I – River Mixing Trial Tests
- Appendix J – Supernatant pH Trimming Tests
- Appendix K – Reference Documentation
- Appendix L – Test Methodologies
- Appendix M – Confirmation Testing
- Appendix N – Guidelines Summary Table V4 modified 190326

Testing throughout 2025 had to evolve to meet the compliance limits being developed for the project. The resultant testing regime (to achieve optimum performance) has shown that optimisation of pH control for the neutralisation phase and final pH adjustment (pH trimming) will be important in achieving removal of dissolved metals.

The most effective test process was where pH of the mine influenced water was raised to pH 8.0 (or higher) during the neutralisation and settling phase, then the resulting treated water pH was lowered to approx. pH 6.5 by dosing with sulphuric acid post settling. This allowed further aluminium precipitates to settle and supernatant concentrations to meet water quality guideline values. This process is represented in three tests (ALT1, ALT2 and ALT3).



The pH sensitivity of the process is shown in the dissolved aluminium results shown below. It will be critical the water treatment plant has good control of both neutralisation (CaO Dosing) and pH trimming (H₂SO₄ dosing).



Overall, the testing has demonstrated that the treated water quality achieved in process testing work can comply with the Modified Compliance Limits as determined by Dr Chris Hickey, RMA Science (*Guideline, Hickey 2026*).

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1 GLOSSARY OF TERMS

The following is a glossary of terms used in this report.

- AMD – Acidic and metalliferous Drainage
- ANZG
- Barren Valley ELF- Raw Sample water from Escarpment “Barren Valley ELF” location
- BPCP
- BVE- Raw Sample water from Escarpment “Barren Valley ELF” location
- CaO – Calcium Oxide (used as water treatment neutralising agent)
- DGV – Default Guideline Value
- DOC – Dissolved Organic Carbon
- DPOC
- EC
- ESE – Escarpment Extension mine site
- EMag45– Proprietary name for Magnesium Oxide powdered product
- Farmguard – Proprietary name for Magnesium Oxide powdered product
- FTAHDS – High Density Sludge
- LoP – Level of Protection
- MAN - Raw Sample water from Stockton “Manchester Street” location
- MetalsorbFZA proprietary name for a coagulant/metal chelating agent
- MFS – Mount Fred South mine site
- MgO – Magnesium Oxide (used as water treatment neutralising agent)
- PFL - Process Flow
- Rheomax 1030 proprietary name for a flocculant
- Rheomax 1050 proprietary name for a flocculant
- S23 – Raw Sample water from Stockton “S23 monitoring” location”
- Subnatant – Treated water or sludge discharge (underflow) from WTP
- Supernatant – Treated water discharge (overflow) from WTP clarifier
- TMF – Toxicity Modifying Factor
- TSS
- WTP – Water Treatment Plant

2 INTRODUCTION

Bathurst Resources Limited (BRL) is seeking to obtain authorisation through the Fast Track Approvals Act (FTAA) to progress development and mining of the coal resources across the wider Buller Plateaux. This project is referred to as the Buller Plateaux Continuation Project (BPCP). Process Flow Limited (PFL) has developed this report on active water treatment for both the Mount Frederick South (MFS) and Escarpment Extension (ESE) sub-areas associated with the BPCP.

The purpose of the BPCP is to consent the existing infrastructure and mining operations associated with the existing Stockton Mine and provide access to additional coal mining areas across the Buller Plateaux and, as the coal resources in the current Stockton mine are close to depletion, develop further coal resources for on-going blending with the Stockton coal.

There are five key project areas:

- Stockton mining area (Stockton)

- Mt Frederick South (MFS)
- Escarpment Extended (ESE)
- Upper Waimangaroa Haul Road (UWHR) Transport Corridor
- Cypress (which is an existing mining area)

3 PROCESS AND TESTING OBJECTIVES

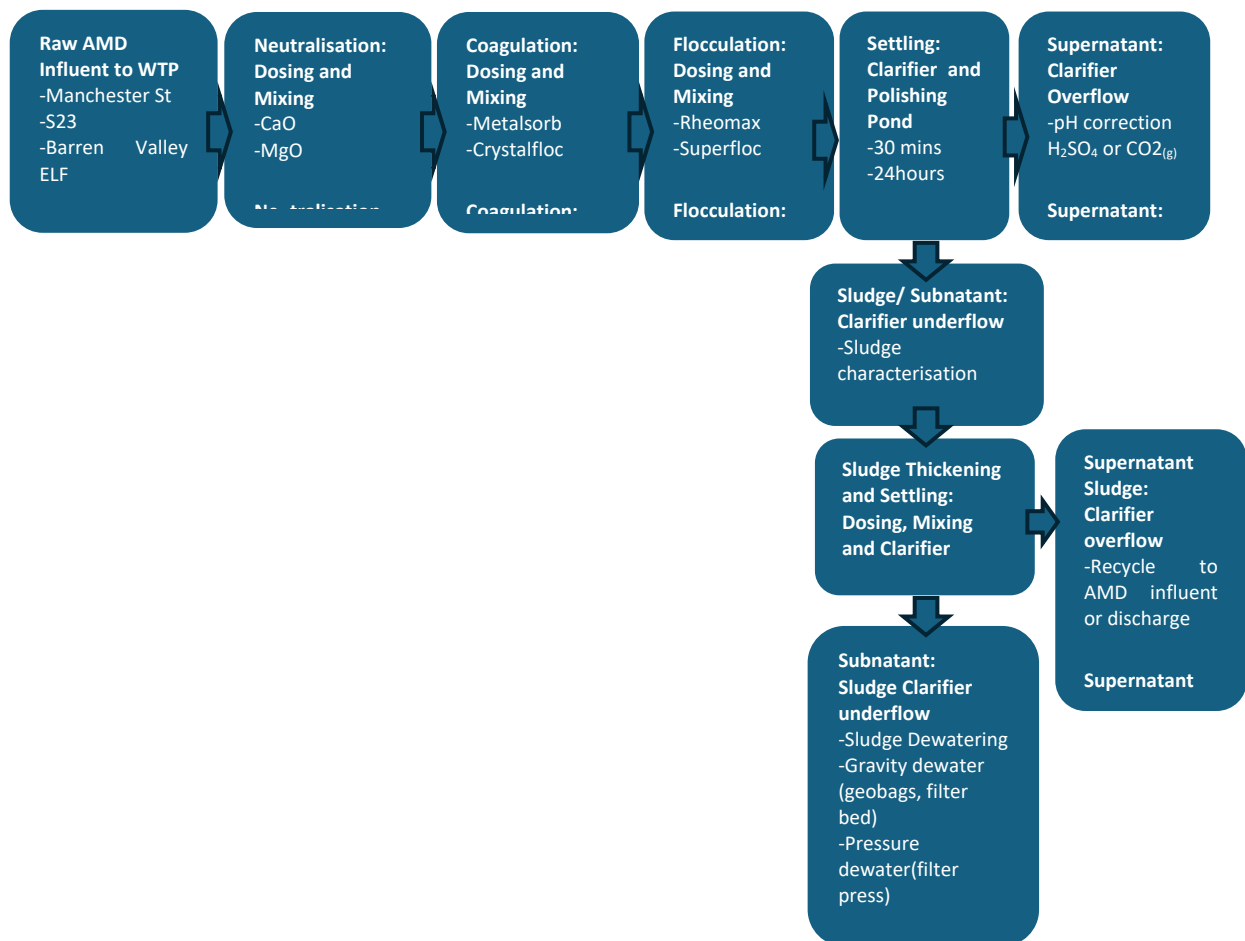
3.1 Process Objectives

The purpose of this work was to inform the water treatment plant design process to ensure treated water outputs could achieve guidelines limits provided by Hickey (2025).

3.2 Active Water Treatment Processes Simulated by Testing

Figure 1. outlines the active treatment processes that have been simulated by the bench and column scale testing performed by Process Flow, for determining the treatment requirements of the Active Water Treatment Plant.

Figure 1 Active WTP Processes Simulated in Testing



3.3 Raw Mine Water Sources Tested

As part of the testing carried out by Process Flow Limited, three current mine water sources were chosen as samples for testing, with the intention that they would be representative of the range of water types the treatment process would be required to treat, at either the ESE or MFS water treatment plant sites.

The water sources chosen for testing are:

- Stockton “S23 monitoring location” – representing a Maximum Water Quality (maximum concentration levels of contaminants)
- Stockton “Manchester Street” (also referred to as MAN) – representing a Mean Water Quality (mean concentration levels of contaminants)
- Escarpment “Barren Valley ELF” – representing a Minimum Water Quality (minimum concentration levels of contaminants)

The three water samples above were tested for optimal Total Suspended Solids (TSS) and Metals removal on both the “as-received water” and the “as-received water with sediment added” to represent high TSS loading conditions.

In the testing, two loading concentrations of sediment were added to the raw water to represent mine site conditions. High sediment loading added was 3000mg/l, with Low Sediment loading at 300mg/l.

3.4 Discharge Water Quality Requirements

Laboratory treatment performance was assessed assuming supernatant water quality from the proposed treatment processes will have to meet the water quality guideline values for discharge, with metals assessed against chronic exposure criteria and TSS / turbidity assessed against nominal criteria in Table 1. For this work Process Flow have demonstrated that the treated water quality achieved in process testing work can comply with the Modified Compliance Limits as determined by Dr Chris Hickey, RMA Science (See Appendix N).

The Level of Protection (LOP) and Modified Compliance Limits for the following dissolved metal parameters have been provided by Dr Chris Hickey, RMA Science (V3, revised 121125) see Appendix N. These are in part based on The Australian and New Zealand Guidelines for fresh and marine water quality (ANZG 2025), Toxicant default guideline values for water quality in aquatic ecosystems which refer to levels of species protection dependant on the current or desired condition of the ecosystem and the associated level of protection that is assigned. In most cases:

- slightly to moderately disturbed system — apply 95% species protection Default Guideline Value (DGV)
- highly disturbed system — apply 95% species protection DGV, although there may be cases where the 90 or 80% species protection DGVs can be applied.

For the ecosystems downstream of proposed active water treatment plant sites at ESE, a LOP of 95% has been applied at the proposed KEL monitoring site and for MFS, an LOP of 90% has been applied at the Smokestack monitoring site.

Toxicity modifying factors (TMFs) have been used to modify the compliance limits for each individual sample. These are pH, hardness (calcium and magnesium concentrations) and dissolved organic carbon (DOC, measured as dissolved purgeable organic carbon (DPOC) in natural waters).

For pH, hardness and DOC values exceeding the TMF range the lowest or highest calculated LoP value has been used (except for dissolved aluminium where a constant 500 µg/L LoP applies to waters below pH 6.5 for all hardness and DOC concentrations).

Process Flow has calculated the proposed Modified Compliance Limits used in the graphs below using the spreadsheet provided by RMA Science (Guidelines Summary Equations V5_190326.xlsx).

The results of the treated water dissolved metals testing are compared to Modified Compliance Limits shown for the three Levels of Protection (LoP) below in section 5.1.3.

Treatment Targets below for pH, TSS and Turbidity in Table 1 have been used by Process Flow in this testing and water quality comparisons.

Table 1 TSS and Turbidity Limits

PARAMETER	TREATED TARGETS
pH	Shall not fall outside a range of 4.5-7
Total Suspended Solids	5mg/l
Turbidity	5NTU

3.5 Testing Performed

The following tests were carried out to determine treatment requirements.

- Jar and column scale coagulation, flocculation and settlement testing – carried out to determine a suitable treatment process to achieve supernatant water quality guideline values post treatment.
- Sludge characterisation and processing testing – carried out to determine suitable treatment and handling processes to thicken and dewater the sludge produced in the water treatment settlement process.
- HDS (High Density Sludge) process testing – carried out to determine whether using the HDS process, whereby a portion of the settled sludge is re-circulated to the settler feed, would enhance the settlement process and sludge characteristics.
- Makeup water testing – Carried out to determine water quality requirements for service water for makeup of treatment reagents and chemicals on site.
- MgO (Magnesium Oxide) treatment testing – carried out to determine potential suitability of MgO as an alternative to CaO (Calcium Oxide) which is currently used in AMD neutralisation at Stockton Mine.
- Bypass water testing – carried out to determine whether bypass water would benefit from neutralisation on discharge, if required.
- River mixing trials – carried out to determine discharge water quality when blending Water Treatment Plant supernatant with river water
- pH Trimming tests – carried out to determine the requirements for lowering pH post treatment if required.

- Aluminium Removal Testing - further dissolved aluminium removal via pH adjustment and further settling processes
- Confirmation testing - replication of preferred processes with all three water samples from Manchester St, Barren Valley Elf and S23, to confirm process parameters and repeatability of the test work.

This report is a summary of the testing carried out, for detailed results, methodologies, laboratory test reports and conclusions, reference should be made to the following documents. These are listed as appendices to this report and are as follows:

- Appendix A – Bench and Column Water Treatment Tests
- Appendix B – Supernatant Quality Tests
- Appendix C – Sludge Characterisation Tests
- Appendix D – Sludge Thickening and Dewatering Tests
- Appendix E – High Density Sludge Process Tests
- Appendix F – Chemical Makeup Water Tests
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4 SUMMARY OF TESTS

4.1 Summary of Water Treatment and Supernatant Quality Tests

Refer to Appendices A, B and M for detailed test reports.

These appendices cover the water treatment testing performed and the supernatant and final treated water quality results.

4.1.1 Water Treatment Testing

Bench scale jar testing and settlement column testing optimisation was carried out to simulate the following processes:

- Neutralisation Lime Dosing (CaO and MgO), rapid mixing and neutralising residence time
- Metal Chelating Agent/Coagulant Dosing, rapid mixing and residence time
- Flocculant Dosing and rapid mixing and residence time
- Floc formation, slow mixing and residence time
- Settling process, settling time and velocity of settled interface
- Treated Water Polishing Pond/Sump, simulated as next day settling results

The following chemicals and reagents were found by screening tests to be the best combination for treatment of the Mean quality Raw Water (Manchester St).

- CaO – Dosed at 260g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax (1050) – Dosed at 1-1.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Flocculation time 10 minutes
- Settling Time 20-30 minutes

Figure 3 Barren Valley ELF (Jar 1), Manchester St (Jar 2), and S23 (Jar 3) AMD at Slow stir Flocculation stage



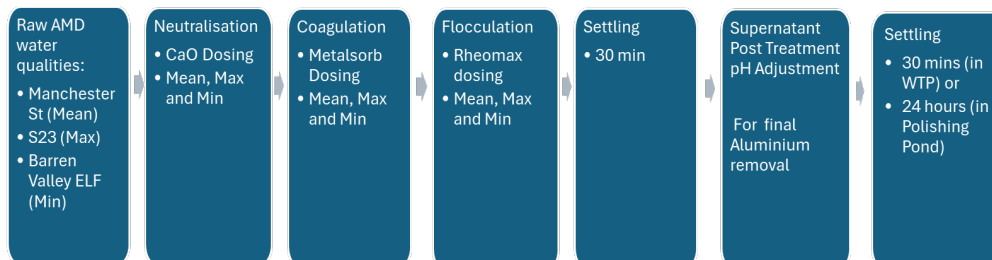
The jar images shown in figure 2, show flocculated material from the three water sources referenced in section 3.3 during the slow stir (flocculation stage) prior to settling.

4.1.2 Supernatant Quality

Acid and metalliferous drainage (AMD) water treatment has been performed at three different process simulation scales: 1 litre Jars, 56 L Columns and 175 L Barrels. The proposed treatment process will generate supernatant water (clean treated water) which will be discharged to further polishing before being released into the natural environment.

Supernatant has been produced from the simulated WTP settling process shown in figure 3, and is discussed in more detail in Appendix B of this report.

Figure 4 Treatment Processes used in Confirmation Testing



Supernatant was also produced as a byproduct of sludge handling and characterisation, High Density Sludge Treatment and Magnesium Oxide Testing. This is discussed in detail in Appendix B.

In general, the testing at three scales, (1 litre bench scale, Column Scale and Barrel test Scale) using CaO, Metalsorb and Rheomax reagents showed that compliant supernatant water quality was able to be achieved using the proposed treatment processes which included Neutralisation, Coagulation, Flocculation, Settling (initial 30 minutes) then pH adjustment and further settling for 30 minutes or 24 hours (Figure 3). This is discussed in more detail in Appendix M- Confirmation Testing.

Table 2. is a snapshot summary table showing the Manchester water confirmation testing results and other testing at bench and column and barrel scale. Results for the other AMD water qualities produced by the confirmation testing of Barren Valley ELF and S23 are shown in PFL-2408-PRO-RPT-00014 – Appendix M.

The most effective test process was where pH of the mine influenced water was raised to pH 8.0 (or higher) during the neutralisation and settling phase, then the resulting treated water pH was lowered to approx. pH 6.5 by dosing with sulphuric acid post settling. This allowed further aluminium precipitates to settle and supernatant concentrations to meet water quality guideline values. This process is represented in three tests (ALT1, ALT2 and ALT3).

In section 5.9, Summary of Confirmation testing, and in Appendix M, it is discussed in more detail where there are non-compliances with the Guideline values for some metals and treated targets for pH, TSS and Turbidity.



Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shaded in orange and those that comply are light green.

Table 2 Supernatant Water Quality Comparison Snapshot – Manchester St Supernatant with Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

			Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling
PF Test Number Identifier and Date Sample Sent for Analysis		Manchester Raw 25-Jul-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
True Hazen Colour	Hazen units	< 10	< 10	< 10	< 10
Turbidity	NTU	23	0.31	0.3	0.16
Turbidity Target	NTU		5	5	5
pH	pH Units	3.2	6.4	6.7	6.7
pH Target	pH Units		4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	< 1.0	5.5	6	6.9
Total Hardness	g/m3 as CaCO3	230	500	500	570
Electrical Conductivity (EC)	mS/m	104.4	95.5	95.7	105.1
Total Suspended Solids	g/m3	16	< 3	< 5	< 3
TSS Target	g/m3		5	5	5
Total Solids (TS)	g/m3	860			-
Dissolved Aluminium	g/m3	44 #1	0.074	0.031	0.024
Dissolved Aluminium Chronic GV 95%	g/m3		0.16	0.17	0.17
Dissolved Aluminium Chronic GV 90%	g/m3		0.2	0.22	0.22
Dissolved Aluminium Chronic GV 80%	g/m3		0.28	0.3	0.30

			Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling
PF Test Number Identifier and Date Sample Sent for Analysis		Manchester Raw 25-Jul-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
Total Aluminium	g/m3	43 #1	0.172	0.65	0.66
Aluminium Al3+****	meq/L	4.8	0.0082	0.0035	0.0026
Dissolved Arsenic	g/m3	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m3	0.00088	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	62 #1	178	200	230 #2
Total Calcium	g/m3	57 #1	184	200	230 #2
Dissolved Chromium	g/m3	0.0045	0.0011	0.0012	0.0014
Dissolved Cobalt	g/m3	0.081	0.001	< 0.0002	< 0.0002
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0007	0.0007	0.0007
Dissolved Copper Chronic GV 90%	g/m3		0.0009	0.0009	0.0009
Dissolved Copper Chronic GV 80%	g/m3		0.0014	0.0014	0.0014
Dissolved Iron	g/m3	9.5	0.02	0.02	0.02

			Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling
PF Test Number Identifier and Date Sample Sent for Analysis		Manchester Raw 25-Jul-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1.0
Dissolved Lead	g/m3	0.00116	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	19.2	13.3	0.69	0.1
Dissolved Manganese	g/m3	1.78	0.18	0.0009	0.0008
Dissolved Manganese Chronic GV 95%	g/m3		1.11	1.11	1.17
Dissolved Manganese Chronic GV 90%	g/m3		1.71	1.71	1.80
Dissolved Manganese Chronic GV 80%	g/m3		2.79	2.79	2.95
Dissolved Mercury	g/m3	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m3	0.197	0.0027	< 0.0005	< 0.0005
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154
Dissolved Zinc	g/m3	1.04	0.0058	< 0.0010	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.122	0.096	0.096
Dissolved Zinc Chronic GV 90%	g/m3		0.182	0.143	0.143
Dissolved Zinc Chronic GV 80%	g/m3		0.313	0.245	0.245
Dissolved Organic Carbon (DOC)	g/m3	1	< 0.5	< 0.5	< 0.5
Absorbance at 254 nm	AU cm-1	0.354	0.004	0.004	0.005

			Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling	Bench Scale Neutralisation, Coagulation, Flocculation, 30min settling, pH adjustment and 24H Settling
PF Test Number Identifier and Date Sample Sent for Analysis		Manchester Raw 25-Jul-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
Transmittance at 254 nm	%T, 1 cm cell	44.2	99	99.2	98.9
Iron + Manganese		11.28	0.2	0.0209	0.0208
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.11	2.11	2.17
Thallium #	g/m3	0.0026	0.00117	0.00068	0.00058
Sulphate	g/m3	570	520	520	560
Potassium #	g/m3	7.1	8.3	8	8.2
Dissolved Sodium	g/m3	3.7 #1	3.8	3.9	3.9 #2
Total Sodium	g/m3	3.6 #1	3.9	4	3.9 #2
Acidity (pH 5.5)	g/m3 CaCO3				-
Acidity (pH 7.0)	g/m3 CaCO3				-
Total Acidity (pH 8.3)	g/m3 CaCO3	360	2.5	1.9	2.2
Chloride	g/m3	3.4	3.6	3.4	3.5
Nitrite-N	g/m3	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m3	0.076	< 0.002	0.014	0.01
Nitrate-N + Nitrite-N	g/m3	0.076	< 0.002	0.015	0.011

Dissolved Metals *DOC – Dissolved Organic Carbon **EC Electrical Conductivity ##Total, as CaCO3 ***TSS #1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods. **** Al3+ is dissolved Al expressed as Al3+ meq, this is not measured using the Aluminium method.

4.1.3 Graphs of Dissolved Metals Compared with Guideline Value LOPs and pH

Below are the graphed results of the Aluminium removal and Confirmation testing compared with the Guideline Values.

The graphs show the results of the treated water dissolved metals, neutralisation pH (after CaO dosing) and final treated water pH (after acid trimming) from Manchester St samples.

The treatment testing to produce these results is discussed in detail in PFL-2408-PRO-RPT-00014 - Appendix M - Confirmation Tests Rev0.

The graphs are separated into results for each dissolved metal parameter subject to proposed compliance limits including (Aluminium, Cadmium, Cobalt, Copper, Iron, Manganese, Nickel, Zinc and Iron+Manganese combined) and then compared to the limits of Modified Compliance Limits of 95%, 90% and 80% LOP.

The pH values for the neutralisation phase of treatment and the final treated pH are also shown. It is noted that the tests with the higher neutralisation pH are showing better overall metals removal, particularly for cobalt where the proposed Modified Compliance Limit is not met for the Cobalt with lower neutralisation pH but does when neutralised to a higher pH, shown in figure 8.

Figure 5 Dissolved Aluminium Results

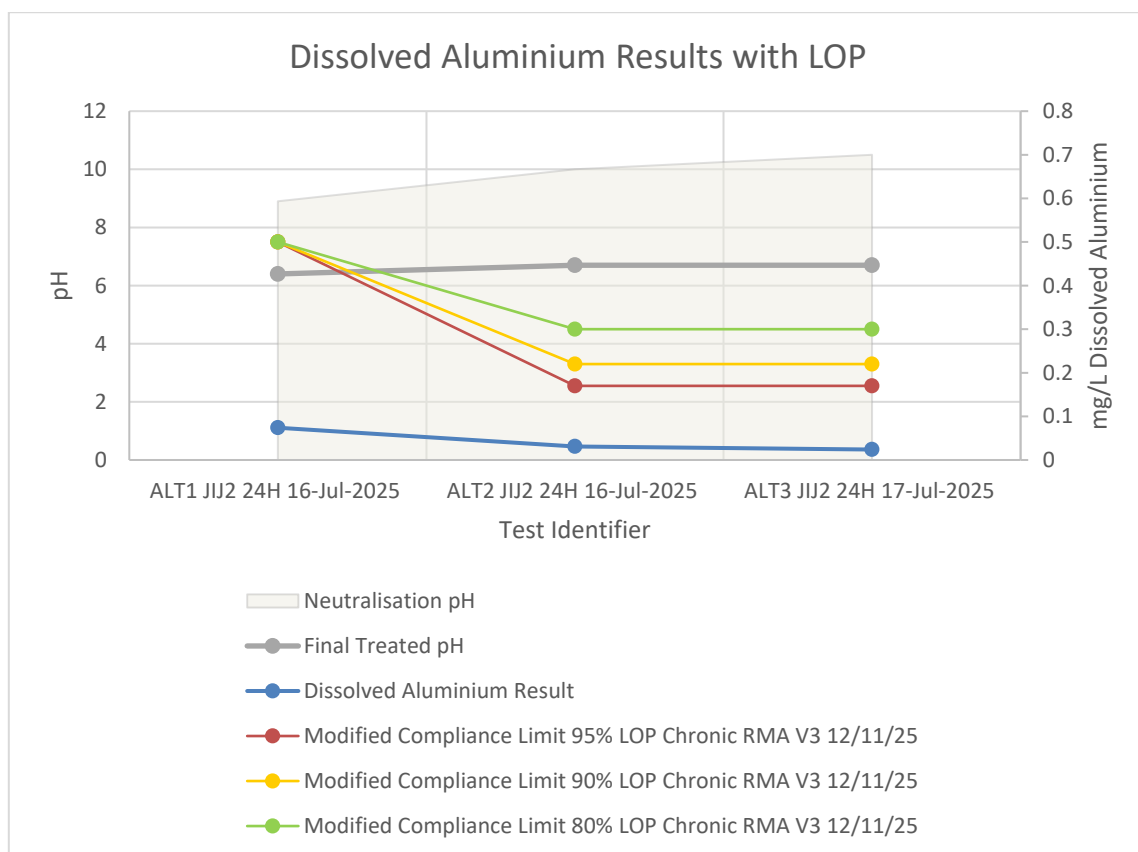
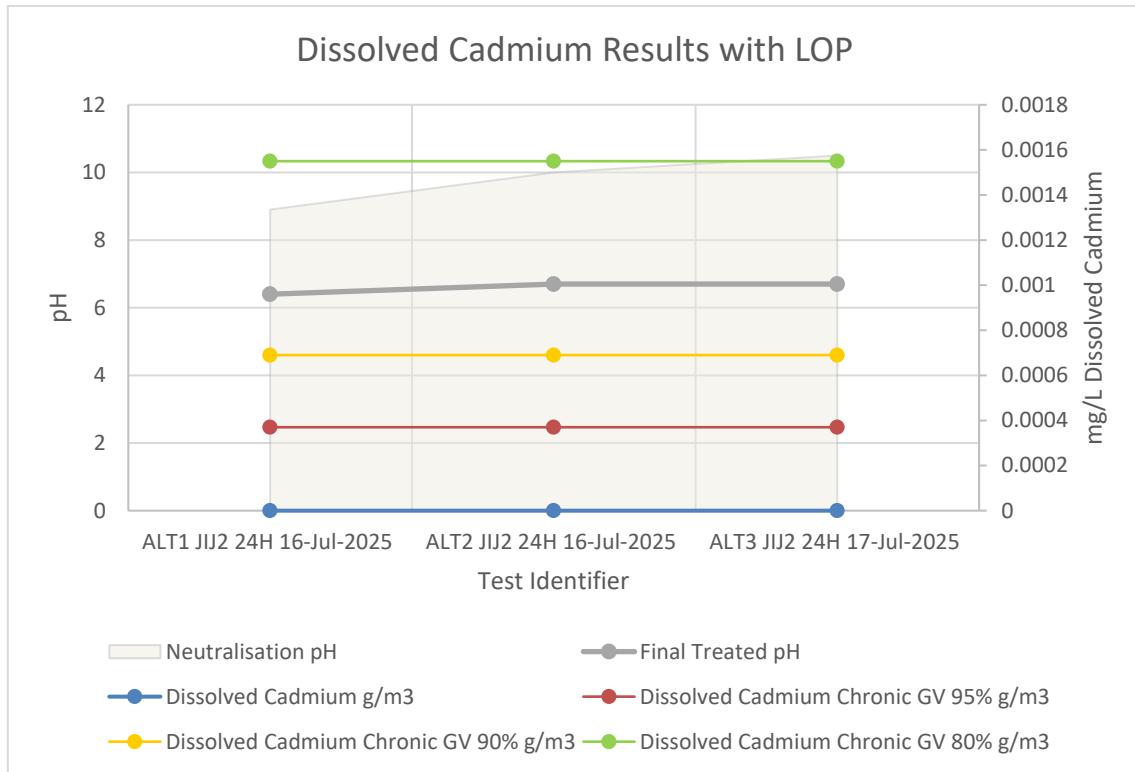
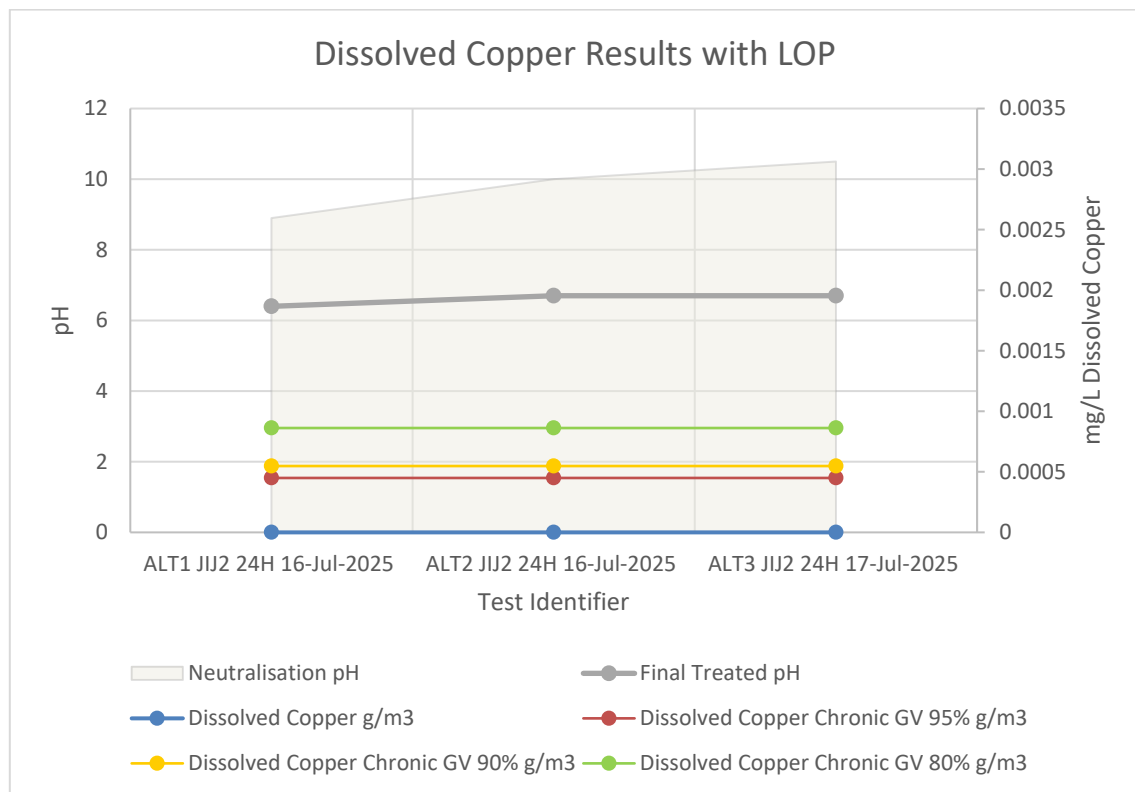


Figure 6 Dissolved Cadmium Results



*Results are not zero (scale not visible) See Tables 4, 5, and 6 in section 13 for actual values

Figure 7 Dissolved Copper Results



*Results are not zero (scale not visible) See Tables 4, 5, and 6 in section 13 for actual values

Figure 8 Dissolved Cobalt Results

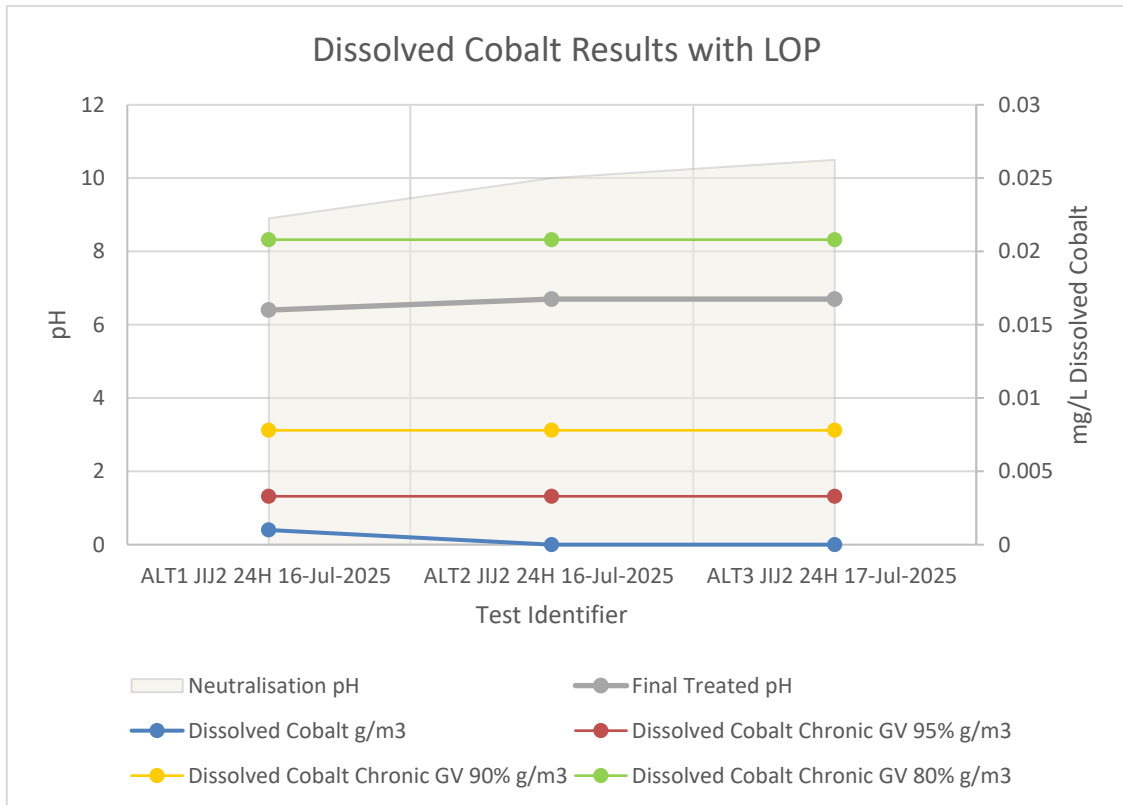


Figure 9 Dissolved Iron Results

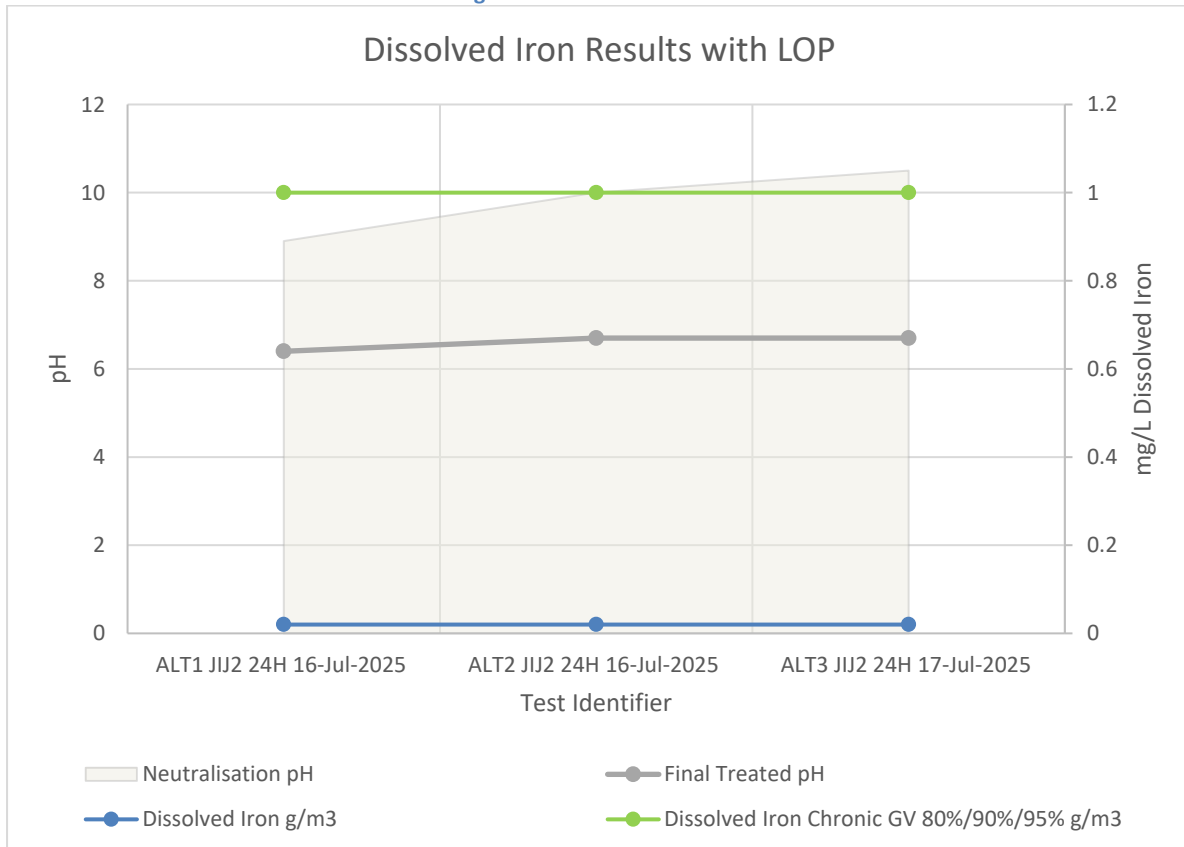


Figure 10 Dissolved Manganese Results

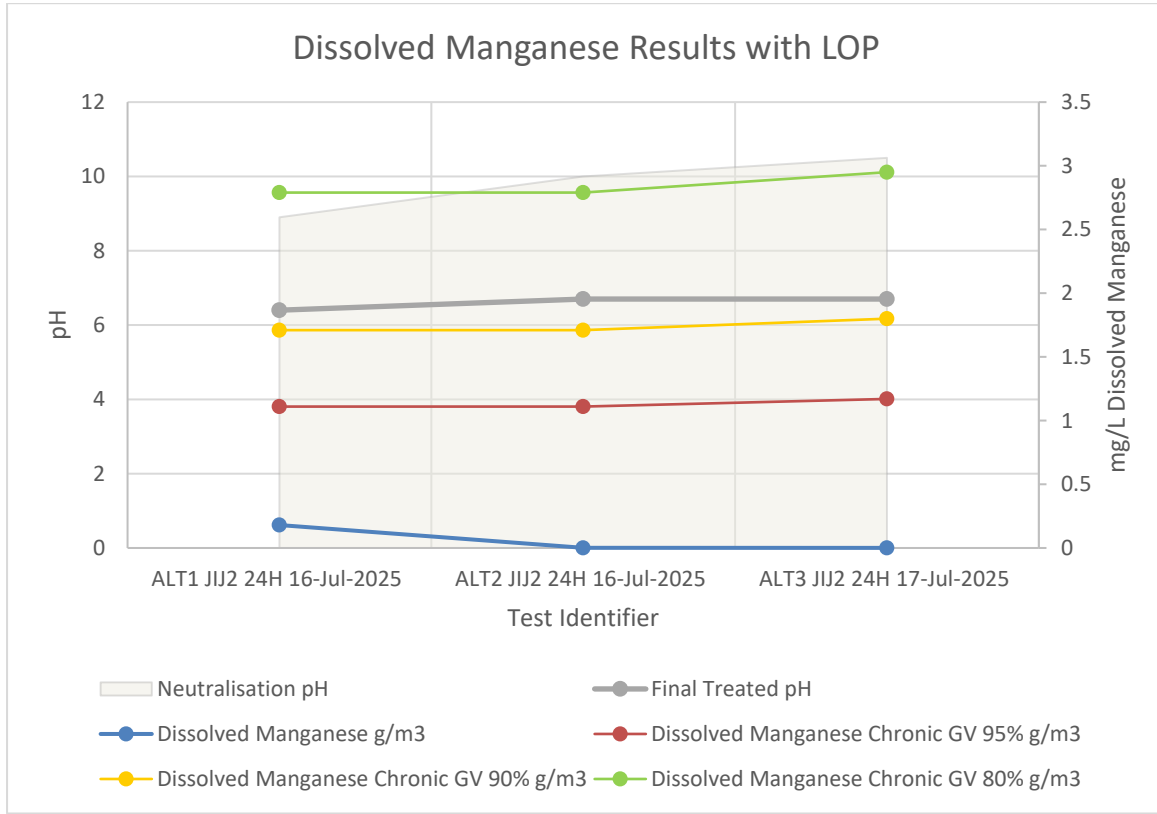


Figure 11 Dissolved Iron + Manganese Results

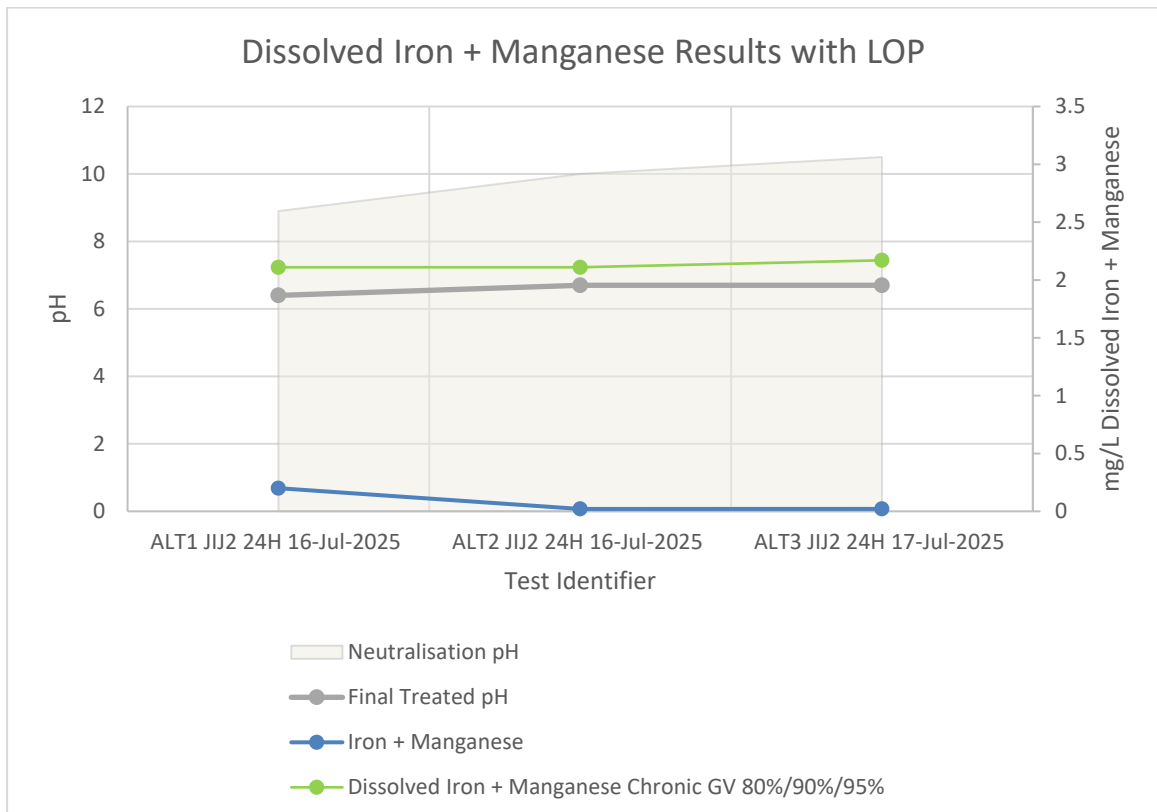


Figure 12 Dissolved Nickel Results

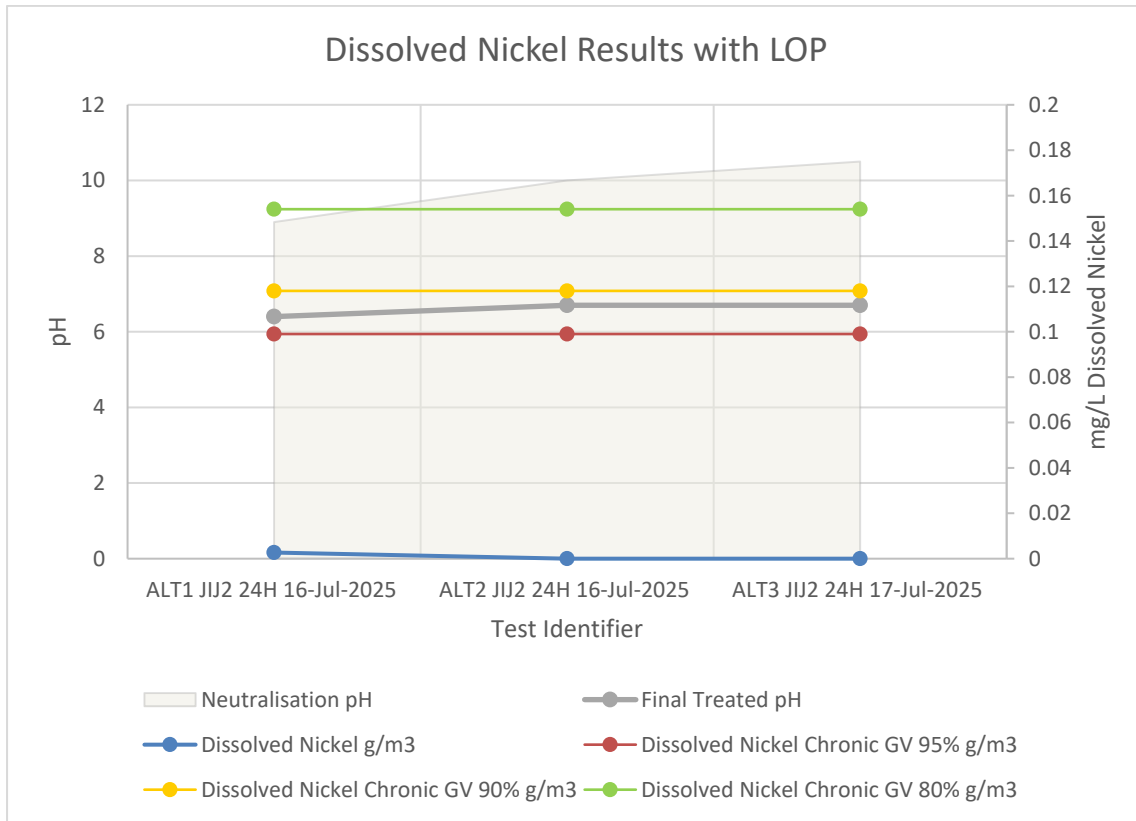
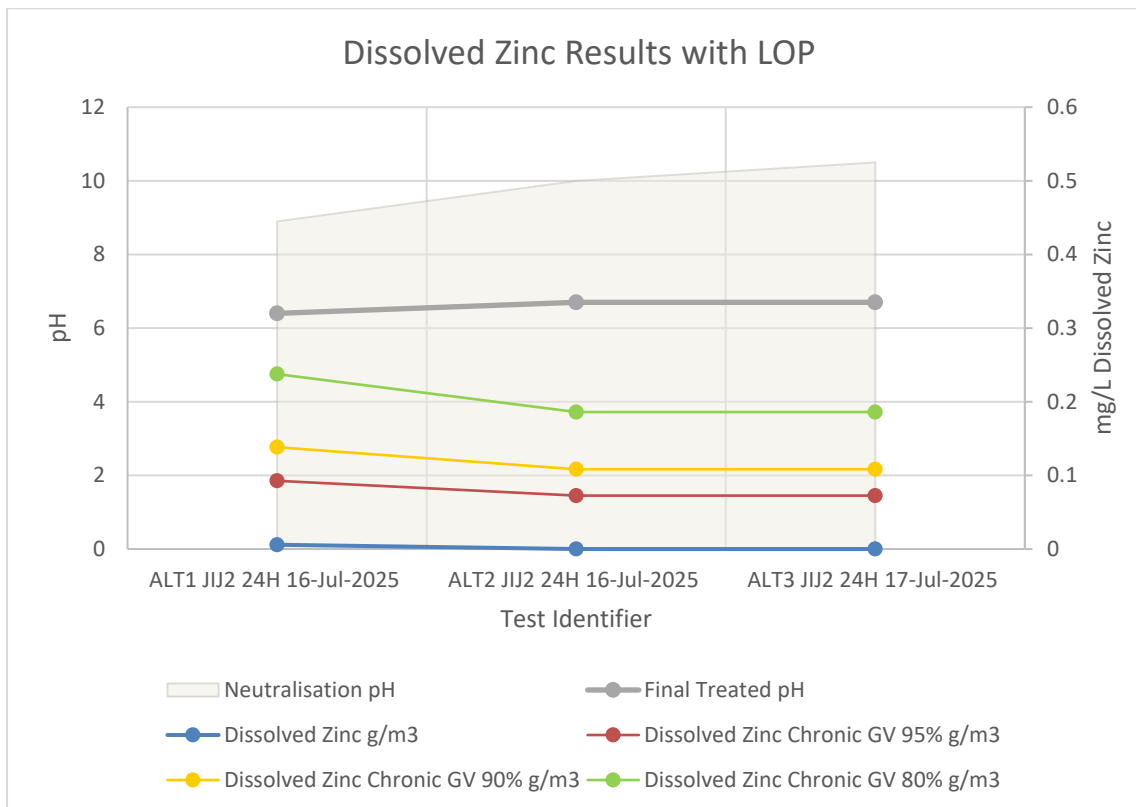


Figure 13 Dissolved Zinc Results



4.2 Sludge Characterisation and Processing Tests

Refer to Appendix C and D for detailed test reports.

The residual byproduct of the proposed AMD treatment process will be lamella clarifier underflow containing residual AMD and TSS sludge. To reduce sludge volumes and improve handleability, sludge thickening and dewatering processes are being considered as part of the WTP process.

Sludge thickening, thickened sludge settling and dewatering processes have been simulated at bench scale and are discussed here.

4.2.1 Solids Thickening Testing

To test for the best conditions for dewatering of the simulated WTP Lamella underflow sludge, Solids Thickening Testing was performed on both Manchester St Sludge (created from Barrel Tests 2 and 6) and from S23 Sludge (from Barrel Test 10).

Investigations included:

- Appropriate Polymer selection
- Polymer dose range trials,
- Mixing optimisation including speeds and times
- Settling trials
- Creating thickened sludge for use in dewatering tests

This testing was carried out on the 10th to the 12th of February 2025.

4.2.2 Thickened Sludge Settling Rates

The best settling rates for thickened sludge were:

Manchester St - 0.366m/hr with Rheomax 1050 dose 7.5mg/l

S23 – 0.098 m/hr with Rheomax 1030 dose 10mg/l.

S23 Thickened sludge settling was not as pronounced as compared to Manchester St, due to the bulk of material in the cylinders. It may be that settling is not required for water like S23 and this thickened sludge could go straight to a dewatering process.

4.2.3 Thickening Sludge Settled Volume and Supernatant Recycle

For the representative mean water condition (Manchester St sample), settling of thickened sludge had settled more than S23, and will allow more removal and recycle of supernatant back to the start of the process at the thickening stage than S23, thus reducing sludge processing volumes at this stage.

Settled sludge volumes for Manchester St ranged from 23% minimum to 93% maximum with an average of 52.7% of the original sludge volume. For S23 the settled sludge volume range was less, with minimum volume at 63.5%, maximum at 100% (no volume reduction) and average at 84.8%.

For Manchester St the average settled thickened sludge supernatant percentage in testing available for recycle was 47.2%, with minimum 7 % and maximum 77%. For S23 the average settled thickened

sludge supernatant percentage in testing available for recycle was 15.2%, minimum 0% (no settling) and maximum 36.5%.

4.2.4 Summary of Sludge Dry matter %

The following are results of dry matter percentage testing on the following:

- Thickened and settled sludge
- Gravity dewatered sludge after thickening and settling
- Gravity dewatered sludge unthickened with settling
- Pressure dewatered sludge after thickening and settling
- Pressure dewatered sludge unthickened with settling

In summary the ranges for dry matter percentages (g/100g) were:

Manchester Thickened Sludge range 0.6 – 1.34% (0.57% unthickened)

S23 Thickened Sludge range 1.81-2.60% (1.87% unthickened)

Manchester Gravity dewater range 2.88-3.33%

S23 Gravity dewater range 3.93-4.18%

Manchester Pressure dewater range 6.34-7.99%

S23 Pressure dewater range 7.74-8.21%

Pressure dewatering percentage moistures obtained by lab trials are expected to be exceeded by mechanical dewatering due to higher pressure equipment, for initial design a recommended dewatered product of >12% should be used.

Note 2: Dry Matter results are obtained by drying the samples at 103°C for 4-22hr (this removes 3-5% more water than air drying), gravimetry.

4.2.5 Settled Thickened Sludge Supernatant Quality

Refer to Appendix D and Appendix B for detailed test report.

Settled thickened sludge supernatant compares well to AMD treated water supernatant from other compliant treatment tests Barrel Test MAN Test 2, Barrel Test 10 S23 and T14S2 MAN (Jar test).

Not only does it compare well, but the Settled thickened sludge supernatant is equivalent or better than the AMD Treated water supernatant and meets the proposed compliance limits for discharge (excluding pH). This opens the possibility that in the full scale WTP that this water may at times be suitable for discharge directly with the treated water and not need to be recycled back to the start of the AMD treatment process.

4.2.6 Sludge Dewatering Testing

Overall, Thickening and Settling results were not necessarily representative of the best Dewatering results. For example, Manchester St with Rheomax 1050 had the best pressure dewatering result with this chemical at 15mg/L but the best settling was at a dose of 7.5mg/l.

S23 did not settle well for most tests due to its bulk. For S23 a different thickening dose was used for the best pressure dewater than for the best gravity dewater.

From a treatment process perspective, the following decisions need to be made when selecting sludge thickening and dewatering equipment:

- If an allowance for removal of supernatant at the thickening settling stage is made then, make allowances for the fact that this would work well with Manchester St type water but not so well for S23 type water.
- Gravity and pressure dewatering equipment selection and process selection will need to consider potentially variable bulk of the sludge depending on influent AMD water quality and have the flexibility to cope with bulkier sludges which may be best sent straight to dewatering immediately after thickening chemical dosing as well as the best bulky sludges that have been settled at the thickening stage.

4.3 HDS Process Testing

Refer to Appendix E for detailed test report.

Hydroxide sludges can have low density, requiring significant dewatering prior to being used as fill onsite and able to be handled with conventional excavation machinery.

The high-density sludge process has potential to improve what can be done up front during the hydroxide precipitation and sedimentation stages of treatment to increase sludge density before dewatering.

The high-density sludge process involves mixing about 80% of the sludge obtained from the underflow from a conventional clarifier, lamella clarifier or thickener and mixing this with the incoming mine water to be treated. Recycles of 10-20 times whilst commissioning the HDS process have been suggested in literature (Coulton et al, and Mackie et al). In our testing we performed 20 sludge recycles.

4.3.1 Outcome of HDS testing

Overall, the HDS process shows promise for increasing settling rates, and thus has the potential to reduce clarifier size. The following conclusions were drawn.

- Settling rates for HDS were better at 5 minutes of settling than for the previous AMD treatment of the same Manchester sample water at the same time.
- Sludge density had started to trend higher as the test progressed through the recycle process
- There is potential for CaO dosing to be reduced as recycled sludge seems to be aiding neutralisation
- There seems to be a point where sludge metals concentration may be causing more difficulties for neutralisation, so there is an opportunity to optimise recycle volumes to prevent this
- HDS Supernatant quality was comparable to other testing using the conventional Coagulation and Flocculation and Settling methods on Manchester St water and did not seem to be worsening in quality as sludge recycles increased

- Trialling the combining of CaO and HDS sludge prior to adding to the AMD could be part of further trials and plant design optimisation in future feasibility studies.

4.4 Chemical Makeup Water Testing

Refer to Appendix F for detailed test report.

Bench Scale testing was carried out using Supernatant water as a makeup water in place of Deionised water to determine the suitability of Supernatant as a makeup water at the WTP.

Methodology during the AMD Treatment testing involved the making up of chemical reagents in solution, such as coagulants, flocculants and CaO and MgO slurries. For the testing work, deionised water was used for chemical solution makeup, to prevent any chemical being added to the solution that may have interfered with the reactions.

On a full plant scale and in-situ at the mine site, a high-quality service water source for chemical solution makeup may not be available and supernatant from the AMD Water treatment process will most likely be used. Therefore, a replicate treatment test was done, using chemical solutions made up with supernatant from previous successful settlement trials.

The AMD treatment replicate test, done with the chemicals made up with supernatant water showed similar treated water quality to the other tests where deionised water was used for makeup.

Overall, it appears that the treated supernatant from the proposed AMD Treatment process would be suitable for chemical makeup and the WTP.

4.5 MgO Testing

Refer to Appendix G for detailed test report.

Initial trials of MgO testing (by PFL, refer to report in Appendix A) of neutralisation in combination with coagulant and flocculants showed that treatment with MgO provided inferior settling to the Calcium Oxide neutralised water.

Results showed that some compliant settled supernatants were achieved using MgO as a neutralent, in combination with Metalsorb as a coagulant and Rheomax1050 as a flocculant, however the settling period was 24 hours to achieve these results. Slaking trials showed that slaking to an ideal slurry was not achieved at 10% MgO concentration using makeup water temperatures of between 20-65°. However, there were distinct results with better supernatant water quality with Farmguard at high temperature of slaking. The EMag45 was less temperature dependant.

The samples were cloudy after 30 minutes settling, which had been seen in previous bench testing (from report in Appendix A). After 24 hours settling had occurred particles could still be seen floating in the supernatant. This is indicating that in the WTP process, MgO would not be able to be used in a settling device with only 30 minutes settling time.

Treated results from 24 hours settling showed that it is possible to achieve water quality guideline values with MgO neutralisation. Settling did not occur within 30 minutes, so this would not be suitable for achieving WTP lamella settling and it is likely that most of the settling would occur in a polishing

pond beyond the WTP. The handling of the slurry, including optimising the slaking and slurry makeup concentration would need to be improved to make this a viable process, as the quick settling and clogging characteristics of the MgO at 10% slurry would make a slurry of this level of concentration a potential operational maintenance issue. Higher concentrated slurries of 20-25% generally are more workable, where there is a suspension with more abrasion, and these should be investigated to see the optimum workable slurry concentration.

4.6 WTP Bypass Water Neutralisation Tests

Refer to Appendix H for detailed test report.

This testing was carried out to simulate neutralisation only of WTP bypass water. This is a scenario that could occur during a storm event that exceeds the maximum design storm, resulting in raw AMD inflow exceeding the WTP Treatment capacity and AMD needing to bypass the Water Treatment Plant. Neutralisation of bypass water only may or may not be used in the final design of water treatment for the sites.

The simulation assumed that there would be neutralisation only using CaO with rapid mixing and a 30-minute settling time (in a basin / sump at the mine), but no flocculation, or coagulation chemical added or process settling in the WTP.

Barren Valley ELF results showed with high pH, metals were reduced below guideline values except for Nickel and Zinc. At lower pHs (5.5-6.0) Cadmium, Cobalt, Copper, Nickel and Zinc exceeded guideline values.

In the mid-range of pH 6.5, Cobalt, Nickel and Zinc did not comply. For all pHs, Aluminium was reduced to below the consent limits. Suspended solids did not comply for any of the tests.

In the Manchester St results, lower to mid pH values around 5.5-7.0 (in the PF testing) yielded results where Cadmium, Cobalt, Nickel, Zinc and Manganese did not comply. With the higher pH value of 7.5, only Nickel, Zinc and Manganese did not comply. For all pHs, Aluminium was reduced to below the consent limits. Suspended solids did not comply for any of the tests.

The AMD WTP treatment (Neutralisation and Coagulation/Flocculation/Settling) processes tested previously and outlined in this report have produced supernatant of a far higher quality than these bypass testing results.

Our assessment of the results is that this process of neutralisation only for treating the bypass has limited use and therefore is not recommended as an effective means of reaching treated water that complies with proposed consent limits. If this process was required to be investigated further, we suggest investigating a two-stage pH process, with a settling basin after each stage, to remove metals that respond to high and low pH sequentially.

The normal water treatment plant process will not be using this bypass method. Testing was carried out using a previous version of the site water management plan where this was a possibility.

4.7 River Mixing Trial Tests

Refer to Appendix I for detailed test report.

To understand the effect of mixing the WTP treated water with a receiving water, the Waimangaroa River, treated supernatant from previous settlement testing and Waimangaroa River waters were blended and tested for compliance with the guideline consent limits.

After blending the river water, the mixed waters complied with the GVs for all mix ratios, with mixed pH in the range of 6.5-7.

Post treatment blending for WTP treated water in receiving waters in the ratios trialled, will provide a buffer for achieving guideline compliance in the receiving waters if required.

4.8 Supernatant pH Trimming Tests

Refer to Appendix J for detailed test report.

This testing was carried out to assess the scenario where treated water pH required trimming to meet compliance limits for all metals. Trimming tests were performed on treated supernatant samples (most tests resulted in a pH between 7.0 and 8.0). Trimming tests were carried out to determine the effect of altering the pH of the treated water with respect to the proposed water quality guideline values.

The trimming tests involved post treatment pH adjustment of supernatant water by addition of the following:

- Citric Acid
- Carbon Dioxide
- Sulphuric Acid

Citric Acid was subsequently discounted as being unsuitable for use in the receiving catchment.

The two other methods of pH adjustment (Carbon Dioxide and Sulphuric Acid) have provided adequate pH adjustment to the range required to meet the guideline consent limits. Both methods had some pH rise over time after dosing.

Alkalinity was reduced using Sulphuric acid, but of all the tests trialled, none had remnant alkalinity after trimming less than 50 mg/l in this set of testing.

Note that in the final confirmation testing (See Appendix M) the post treatment (including pH trimming) alkalinity was reduced to 3.2-3.7mg/l for Manchester St Treated AMD water, which included a second settling step for aluminium removal.

Both Carbon Dioxide and Sulphuric acid are widely used in water treatment and industry, and their dosing technologies are proven and will provide effective control.

Practical on-site considerations including the logistics of getting Carbon Dioxide Gas delivered to site versus Sulphuric Acid (which is already used on site) favour using sulphuric acid to adjust post-treatment pH where required.

4.9 Final Confirmation Testing

Refer to Appendix M for detailed test report.

Testing has shown that removal of metals and other contaminants from the test sites AMD raw water is possible to the limits of the modified Guideline Values. With the water tested at bench and column scale, it was observed that there was an Aluminium residual and at times Cobalt, Nickel, Manganese, and Zinc, which continued to be slightly elevated for some results.

For details refer to Reports PFL-2408-PRO-RPT-00001 - Appendices A-L to PFL-2408-PRO-RPT-00015 - Appendix N Guidelines Summary Tables V3 modified 121125.

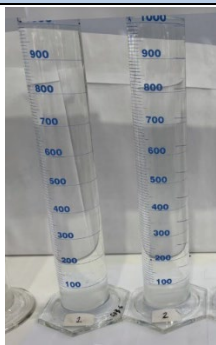
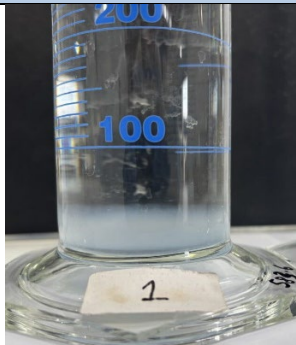
Reduction of Cobalt, Nickel, Manganese and Zinc has been possible at higher neutralisation pH but this still leaves an Aluminium residual if the final treated water pH is high. This is because Aluminium is amphoteric in nature, becoming increasingly soluble at higher pH.

To mitigate this, trials were performed simulating a process of lowering the final treated pH of the supernatant from our previous treatment process of neutralisation, coagulation, flocculation and settling and providing additional settling time to allow further aluminium precipitates to settle. For this testing we used supernatant from previous barrel tests of one known water quality (Manchester St January 2025 Sample).

The aim was to determine if the Aluminium residual could be reduced by further settling (for 24 hours after pH adjustment to simulate the effect of a polishing pond).

The results of the aluminium residual showed promising reduction after this additional process. It was discussed that this may be achieved with a shorter post treatment settling time of 30 minutes, which would then give the possibility of the aluminium being removed at the WTP in another settling vessel, rather than relying on the polishing pond for this process.

Figure 14 Summary of Aluminium Removal for Manchester Water Type using 24 hours settling post pH reduction

TREATMENT PROCESSES	COMMENTS	PHOTOS, MANCHESTER, FROM ALUMINIUM TESTING
pH Trimming with Sulphuric, Slow Stir for 10 mins, then Settle 24 hours	After 24 hour Settle Mimic of second settle Polishing Pond (Right) Showing approx. 10mm of white fluffy flocs on base of cylinder (Aluminium Removal)	 

As a confirmation of these results, a full set of process simulations were performed at bench scale on all three water types previously tested, using 30 minute and 24-hour settling times post WTP setting and pH adjustment. Fresh samples of the Barren Valley ELF, Manchester St and S23 water samples were used for this testing and Raw Water Quality of these was tested and compared to previous testing to calculate new dosing rates for neutralisation, coagulation and flocculation chemicals.

4.10 Results Discussion

The replication of neutralisation, coagulation, flocculation and the first setting stage all performed well, with comparable settling to previous testing as the table below shows. The table below shows the three different water types, during the first stages of the WTP processes up to the first settling stage.

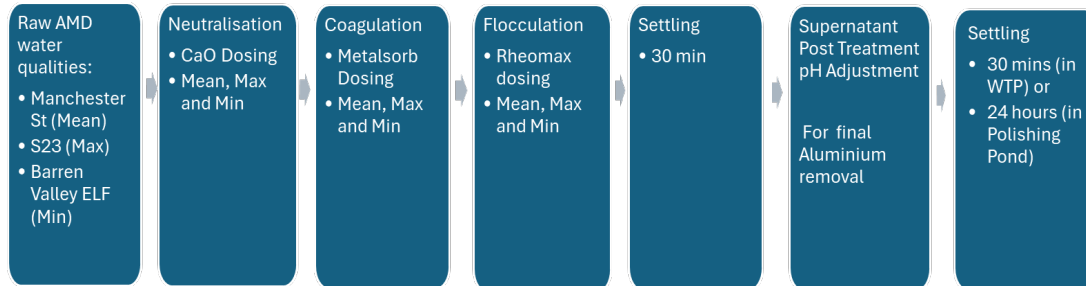
Table 3 Summary of Confirmation Testing of 3 Water Types up to Supernatant 3 Stage (BVE (Jar 1), MAN (Jar 2) & S23 (Jar 3))

PROCESSES	COMMENTS	PHOTOS LEFT TO RIGHT : BVE, MANCHESTER ST, S23
Start of Test	Sediment added, no Neutralent, Coagulant, Flocculant	
Rapid Mix 20 minute 350 RPM	Neutralisation	
Slow Stir 10 minutes 20 RPM	Coagulant and Flocculant Added	
Settling (first settling stage)	Left: Start of settling Right: After 30mins Settling	

4.10.1 Treatment Process and Guideline Values

The full treatment process simulated is shown below.

Figure 15 Treatment Processes used in Confirmation Testing



Proposed New modified Guideline Values have been developed by Dr Chris Hickey for the BPCPt (refer to PFL-2408-PRO-RPT-00014 - Appendix N Guidelines Summary Tables V3 modified 121125) and are compared here with this set of testing supernatant which represents the process result for expected discharge water quality (from bench testing scale only). Reproduction of these tests at larger scale is recommended prior to detailed design of the WTP, with a pilot plant recommended to confirm scaling up of the process and continued compliance with limits at scale.

4.10.2 Aluminium Removal Testing Results

Please see test results tables in section 3.13 relating to this testing.

This testing was performed prior to the confirmation testing on Manchester St water only.

The results of the aluminium residual from removal testing showed promising reduction after an additional 24-hour settling process. It was discussed that this may be possible to achieve with a shorter post treatment settling time of 30 minutes, which would then give the possibility of this occurring at the WTP in another settling vessel, rather than relying on the polishing pond for this purpose.

All proposed Guideline Values and treatment targets were met for all the LoP with the aluminium removal treatment process.

4.10.3 Confirmation Testing Results – Manchester St

Dosing from bench and column scale testing was replicated and adjusted for new water samples. The dosing and settling process details are below:

Manchester St Raw Water Sample – Bench scale test -3g/m³ sediment added

- CaO – Dosed at 226-230g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- First Settlement time 30 minutes,
- Rapid mix with acid for 1 minute at 350rpm
- Sulphuric Acid Dose 3.6g/m³
- Second settlement time 30 min and 25 hours trialled

- First settle - Settlement test rate range Bench Cylinder 0.7-0.9 m/hr & Column 4.8 m/hr - 5.6m/hr (no scale factor)

Please see test results tables in section 3.13 of Appendix M, relating to this testing.

Run 1,2 and 3 show Manchester St Sample water treatment. The results showed good compliance for all three stages of treatment (Super 3,4 and 5), with Super 4 and 5 samples giving slightly better cobalt results and pH compliance.

Run 1, with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling only (Super 3), showed compliance with all proposed Modified Guideline Values except dissolved cobalt at 95% and 90% LOPs. The pH did not comply with the target and was slightly elevated at pH7.2.

Run 2 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 30mins settling (Super 4), showed compliance with all proposed Modified Guideline Values except dissolved cobalt at 95% LoP.

Run 3 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 24hrs settling (Super 5), showed compliance with all proposed Modified Guideline Values except dissolved cobalt at 95 % LoP.

4.10.4 Confirmation Testing Results – Barren Valley ELF

Dosing from bench and column scale testing was replicated and adjusted for new water samples. The dosing and settling process details are below:

BVE Raw Water Sample – Bench scale test -3g/m³ sediment added

- CaO – Dosed at 68-72/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 1g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- First Settlement time 30 minutes,
- Rapid mix with acid for 1 minute at 350rpm
- Sulphuric Acid Dose 2-4.7g/m³
- Second settlement time 30 min and 25 hours trialled
- First settle - Settlement test rate range Column 5.9m/hr (no scale factor)

Please see test results tables in section 3.13 of Appendix M, relating to this testing.

Run 4, 5 and 6 show BVE Sample water treatment.

Run 4, with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling only (Super 3), showed compliance with all proposed Modified Guideline Values except dissolved cobalt at all LOPs and Nickel at LoP 95%. Target pH was not complied with also being slightly elevated at pH7.2.

Run 5 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 30mins settling (Super 4), showed compliance with all proposed Modified Guideline Values except dissolved cobalt at all LOPs and Nickel at 95% LOP.

Run 6 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 24hrs settling (Super 5), showed compliance with all proposed Modified Guideline Values except dissolved cobalt at all LOPs, Nickel at 95% and 90% LOPs and Zinc at 95% and 90% LOPs.

4.10.5 Confirmation Testing Results – S23

Dosing from bench and column scale testing was replicated and adjusted for new water samples. The dosing and settling process details are below:

S23 Raw Water Sample – Bench scale test -3g/m³ sediment added

- CaO – Dosed at 1600-1676 g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 3g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- First Settlement time 30 minutes,
- Rapid mix with acid for 1 minute at 350rpm
- Sulphuric Acid Dose 2.2-3.5g/m³
- Second settlement time 30 min and 25 hours trialled
- First Settle - Settlement test rate range Column 2.4-3.3m/hr (no scale factor)

Please see test results tables in section 3.13 of Appendix M, relating to this testing.

Run 7, with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling only (Super 3), showed compliance with all proposed Modified Guideline Values except Dissolved cobalt at 95% LOP and Manganese at LoP 95%.

Run 8 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 30mins settling (Super 4), showed compliance with all Modified Guideline Values except dissolved cobalt at 95 and 90% LOP, manganese at 95% and 90% LOP, and Iron plus Manganese at all LOP.

Run 9 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 24hrs settling (Super 5), showed compliance with all Modified Guideline Values except dissolved cobalt at all LOPs, manganese at 95% and 90% LoP, and Iron plus Manganese at all LOP.

4.10.6 Conclusions from Confirmation testing

Testing has confirmed that Manchester St water quality type water is able to meet the guideline values and treatment targets for all except Cobalt, unless neutralised to a higher pH.

Barren Valley ELF and S23 water types would need more optimisation to comply, and this would most likely be in the form of higher neutralisation pH, to remove metals such as Nickel and Manganese to lower residual levels.

Figure 16 Barren Valley ELF, Manchester St and S23 AMD at Slow stir Flocculation stage



4.11 Process Considerations for Full Scale WTP Design

1. Neutralisation in some cases needed more than 20 minutes, sometimes closer to 30 minutes for pH to stabilize, particularly for the cleaner waters (Barren Valley ELF and Manchester St waters with lower metals concentrations than S23). The poorer quality waters (S23 and at times Manchester St) needed closer to 20 minutes. For previous testing we had used 20 minutes neutralisation as a standard time for comparison between results.

Implications for scaling up should consider including an allowance for extended neutralisation to 30 minutes to allow for variability in neutralisation times.

2. Water Temperatures for this testing were usually in the range 8-11°C. In previous testing (Bench scale, Columns and Barrels) water temperatures ranged from 10 to 22°C, depending on the time of year the tests were done.

Implication for full scale WTP is that the chemical reaction times and dosing may be affected by water temperature fluctuations and allowance should be made for that in the final process design.

3. pH – it was difficult to achieve pH 8 accurately using the 20% CaO slurry at bench scale, particularly when treating the lower concentration AMD (Barren Valley ELF). The 20% slurry dose equates to a very small dose volume (0.35-0.4 mls for Barren Valley ELF, Manchester 1.3-1.4 mls, S23

was 4.5mls), with any variability in the slurry consistency or particle size having potential to have a larger effect than it would at full plant scale.

Implications for full plant scale are that this dosing accuracy would improve with larger pipework and valves in relation to the slurry particle size.

4. Surface flow and Floc coating on the pH meter was evident in both 1st and 2nd flocculation stages in the slow mix phase. The flocs from both flocculation mixing stages tend to be sticky so there is a need to consider clogging and maintenance of equipment including pH meters and samplers. On the first stage of settling some flocs were observed floating on the surface of the settling column. These could contribute to floc carry-over and cause a poor treatment result. Allowance should be made to skim these off or have a subsurface outlet.

Implication for full scale WTP is, sampling for pH for full scale process control would need to prevent fouling of pH meters, or a self-cleaning probe arrangement. Consideration of the configuration of outlets of the clarifiers is also required.

5. When higher Neutralisation pH was reached, the second stage flocculation (Aluminium precipitation) had larger flocs which appeared to settle more readily.

There is potentially a benefit for final pH trimming and Aluminium removal (for settling stage two) of having excess CaO left in solution after the initial settling phase, to provide additional seeding for precipitated aluminium.

Implications for the WTP are that raising neutralisation may provide a dual benefit of improved non-aluminium metal removal at stage one settling and give extra CaO particulates for seeding the aluminium removal by the settling stage two.

6. During the Second stage of flocculation the flocs were difficult to see. It may be beneficial to consider using a coagulant at this stage also if good Aluminium removal is not achieved, as this may improve settling.

Results however did show good Aluminium removal was possible, even with low visibility of floc.

7. The coagulant made up with the supernatant (process water) had a visible brown sediment in the bottom. It is unclear if this sediment came from the supernatant (possibly) and changed colour when the concentrated reagent was added or whether the sediment formed when the reagent was prepared. This was not observed in the flocculant prepared with Deionised water and not in the previous testing when flocculant was prepared with supernatant.

8. Supernatant recovery volume was about 90% of settling of stage 1 settling and 90% of the stage 2 settling (81% of original AMD).

Implication for full scale supernatant volumes would be that the full-scale separating techniques may produce even more efficiency of supernatant decant.

9. For the final pH trimming the pH took about 3-4 mins to stabilize following the addition of acid (with 350RPM stirring).

Implications for full scale WTP plant are that vessel sizing should allow for this and also some variability depending on effectiveness of dosing.

10. Chemical makeup water effects

It is noted that the coagulant/chelating agent Metalsorb solution was prepared using Barrel Test 2 Supernatant to replicate WTP conditions, where supernatant would be used for process and service water. In previous Barrel and Bench testing Deionised water had been used to prepare chemical dosing solutions, to prevent chemical interference from any contaminants in the water, for testing.

The Barrel 2 Supernatant for Metalsorb makeup had some residual sediment/flocs present. In the supernatant the flocs were white in appearance and after preparation of the Metalsorb Coagulant a dark brown sediment was visible which settled out in the bottle. (Note this was not observed during the earlier chemical makeup testing).

Reaction between the supernatant and concentrated Metalsorb could have reduced the effectiveness of the coagulant due to being partially used up in chemical solution preparation.

At full scale, this would need to be accounted for by adding a dose adjustment to ensure the required dosing potential of the solution is available.

4.12 Scale up considerations

Process variability at bench scale highlights the potential for variability at full scale.

Factors crucial to full scale WTP design will be as follows:

- the scale up and adjustment of dosing rates, accounting for variable flow and water quality
- accounting for metals residuals in the chemical makeup water and their effect on dose rates
- the variability of the raw AMD water quality, including sediment loading variability on acidity
- the AMD response to a range of dosing rates and
- the sensitivity of both the neutralisation phase and the aluminium removal process to change in pH.
- Secondary effects of floc break up or mobilisation from external factors e.g. pumping

The sensitivity of both the neutralisation and aluminium processes to pH has been highlighted in our confirmation testing. The wider implication of pH sensitivity is that the process control of all chemical dosing will be crucial to the performance of the metal's removal processes.

4.13 Aluminium Removal Testing and Confirmation Testing Results

Table 4 shows the Aluminium Removal Testing and Confirmation Testing results in detail. This testing was performed on Manchester St raw water and shows the dosing, mixing and settling process details for Manchester St. For the other two waters, BVE and S23, see the more detailed tables in Appendix M. It shows that neutralising to a higher pH and trimming using sulphuric acid post settling achieves the GVs for all parameters.

Table 4 Supernatant Water Quality Results – Aluminium Removal Testing July 2025 – Barrel Test Supernatant with pH adjustment, Flocculation and Settling – Hills Results

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
True Hazen Colour	Hazen units			< 10		< 10		< 10
Turbidity	NTU	16.8	2.1	0.31	1.59	0.3	1.23	0.16
Turbidity Target	NTU		5	5	5	5	5	5
pH	pH	3.1	7.9	6.4	9.7	6.7	10.9	6.7
pH Target	pH		4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3*	< 1.0	14.8	5.5	48	6	102	6.9
Total Hardness	g/m3*	197	510	500	520	500	580	570
Electrical Conductivity (EC)	mS/m	103.7		95.5		95.7		105.1
Total Suspended Solids	g/m3	17	9	< 3	15	< 5	6	< 3
TSS Target	g/m3		5	5	5	5	5	5
Total Solids (TS)	g/m3							
Dissolved Aluminium	g/m3	46	1.67	0.074	7.7	0.031	14.9	0.024
Dissolved Aluminium Chronic GV 95%	g/m3		0.24	0.16	0.30	0.17	0.34	0.17
Dissolved Aluminium Chronic GV 90%	g/m3		0.30	0.20	0.38	0.22	0.43	0.22
Dissolved Aluminium Chronic GV 80%	g/m3		0.42	0.28	0.52	0.30	0.58	0.30
Total Aluminium	g/m3			0.172		0.65		0.66
Aluminium Al3+	meq/L			0.0082		0.0035		0.0026
Dissolved Arsenic	g/m3			< 0.0010		< 0.0010		< 0.0010
Dissolved Cadmium	g/m3	0.00082	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037	0.00037	0.00037

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	53	183	178	210	200	230	230 #2
Total Calcium	g/m3			184		200		230 #2
Dissolved Chromium	g/m3	0.0042	0.0009	0.0011	0.0012	0.0012	0.0013	0.0014
Dissolved Cobalt	g/m3	0.085	0.0007	0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0148	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0007	0.0007	0.0007	0.0007	0.0008	0.0007
Dissolved Copper Chronic GV 90%	g/m3		0.0009	0.0009	0.0009	0.0009	0.0010	0.0009
Dissolved Copper Chronic GV 80%	g/m3		0.0014	0.0014	0.0014	0.0014	0.0016	0.0014
Dissolved Iron	g/m3	3.5	0.02	0.02	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1.0	1.0	1.0	1.0	1.0	1.0
Dissolved Lead	g/m3	0.00159	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	15.6	13.4	13.3	0.56	0.69	0.08	0.1
Dissolved Manganese	g/m3	1.41	0.158	0.18	0.0005	0.0009	0.0005	0.0008
Dissolved Manganese Chronic GV 95%	g/m3		1.12	1.11	1.13	1.11	1.18	1.17
Dissolved Manganese Chronic GV 90%	g/m3		1.72	1.71	1.74	1.71	1.82	1.80

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
Dissolved Manganese Chronic GV 80%	g/m3		2.81	2.79	2.84	2.79	2.97	2.95
Dissolved Mercury	g/m3			< 0.00010		< 0.00010		< 0.00010
Dissolved Nickel	g/m3	0.2	0.0032	0.0027	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	0.99	< 0.0010	0.0058	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.036	0.122	0.031	0.096	0.033	0.096
Dissolved Zinc Chronic GV 90%	g/m3		0.054	0.182	0.046	0.143	0.049	0.143
Dissolved Zinc Chronic GV 80%	g/m3		0.092	0.313	0.078	0.245	0.084	0.245
Dissolved Organic Carbon (DOC)	g/m3	0.8	< 0.5	< 0.5	< 0.5	< 0.5	0.6	< 0.5
Absorbance at 254 nm	AU cm-1	0.109	0.013	0.004	0.015	0.004	0.004	0.005
Transmittance at 254 nm	%T, 1 cm cell	4.91	97.1	99	96.6	99.2	99.1	98.9
Iron + Manganese		4.91	0.178	0.2	0.0205	0.0209	0.0205	0.0208
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.12	2.11	2.13	2.11	2.18	2.17
Thallium #	g/m3			0.00117		0.00068		0.00058
Sulphate	g/m3			520		520		560
Potassium #	g/m3			8.3		8		8.2
Dissolved Sodium	g/m3			3.8		3.9		3.9 #2
Total Sodium	g/m3			3.9		4		3.9 #2
Acidity (pH 5.5)	g/m3 CaCO3							

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan- 2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan- 2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
Acidity (pH 7.0)	g/m3 CaCO3							
Total Acidity (pH 8.3)	g/m3 CaCO3			2.5		1.9		2.2
Chloride	g/m3			3.6		3.4		3.5
Nitrite-N	g/m3			< 0.002		< 0.002		< 0.002
Nitrate-N	g/m3			< 0.002		0.014		0.01
Nitrate-N + Nitrite-N	g/m3			< 0.002		0.015		0.011

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange, those that comply are in light green.

Table 5 Confirmation Testing August 2025 - Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

Supernatant Type			3 (WTP 30min 1st settled only)	4 (pH adjust, WTP 30min 2nd settling)	5 (pH adjust, Pond 24hr 2nd settling)
PF Test Number Identifier and Date Sample Sent for Analysis			Conf Run 1B 30 Min 06-Aug-2025 3:00 pm	R2 Man Super 4 07-Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm
Hills Lab Number:		3951088.20	3962556.1	3962556.2	3962556.3
Sample		Manchester Raw 25-Jul-2025	Manchester st	Manchester st	Manchester st
Neutralent			CaO	CaO	CaO
Dose		g/m3	230	226	226
Chemical makeup with previous AMD Treated Water Supernatant			Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25
Coagulant			Metalsorb	Metalsorb	Metalsorb
Flocculant			Rheomax	Rheomax	Rheomax
Sediment added			3g	3g	3g
Rapid Mix time (Neutralisation)	minutes		20	20	20
Rapid Mix time for coagulant addition	minutes		1	1	1
Rapid Mix time for flocculant addition	minutes		1	1	1
Slow Mix Time	minutes		10	10	10
Settling Time	minutes		30	30	30
Test Vessel Size			1 L	1 L	1 L
Additional pH modification			0	Sulphuric acid 1%	Sulphuric acid 1%
Amount of 1% acid added	mL 1%		0	0.35	0.32
Dose of 100% Sulphuric	g/m3		0	3.5	3.2
Slow stir time	minutes		0	10	10
Second Settling Time	hrs		0	24	24

5 APPENDICES:

- Appendix A – PFL-2408-PRO-RPT-00002 Water Treatment Tests
- Appendix B – PFL-2408-PRO-RPT-00003 Supernatant Quality Tests
- Appendix C – PFL-2408-PRO-RPT-00004 Sludge Characterisation Tests
- Appendix D – PFL-2408-PRO-RPT-00005 Sludge Thickening and Dewatering Tests
- Appendix E – PFL-2408-PRO-RPT-00006 High Density Sludge Process Tests
- Appendix F – PFL-2408-PRO-RPT-00007 Chemical Makeup Water Tests
- Appendix G – PFL-2408-PRO-RPT-00008 MgO Tests
- Appendix H – PFL-2408-PRO-RPT-00009 WTP Bypass Water Neutralisation Tests
- Appendix I – PFL-2408-PRO-RPT-00010 River Mixing Trial Tests
- Appendix J – PFL-2408-PRO-RPT-00011 Supernatant pH Trimming Tests
- Appendix K – PFL-2408-PRO-RPT-00012 Reference Documentation
- Appendix L – PFL-2408-PRO-RPT-00013 Test Methodologies
- Appendix M – PFL-2408-PRO-RPT-00014 Confirmation Testing
- Appendix N – PFL-2408-PRO-RPT-00015 Guidelines Summary Table V4 modified 190326

Active Water Treatment Testing Report

Appendix A – Bench and Column Scale Water Treatment Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	30/03/2026
Document Number:	PFL-2408-PRO-RPT-00002

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Concept	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	23/09/2024
B	Review	Re-issued as Appendix A	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated with Client Comments			G Smith	25/03/2026
2	For Use	Updated minor comments			G Smith	30/03/2026

EXECUTIVE SUMMARY

BT Mining and Bathurst Resources have engaged Process Flow as part of the Buller Plateau Continuation Project (BPCP) at two of the sub-area known as Mt Frederick South (MFS) and Escarpment Extension (ESE), investigating methods to manage mine influenced water as part of the mine development. Process Flow Ltd has been engaged for provision of process engineering services to establish the requirements of a water treatment process, for the MFS and ESE sub-areas. Part of this work is to provide water quality and treatment optimisation testing to inform the treatment design process. This report details the testing performed and results.

Preliminary Bench Jar scale and Column settlement testing has been being carried out using three different mine influenced waters obtained from the existing Stockton and Escarpment mining areas including water from sample locations at Manchester St (MAN), S23 (S23) and Barren Valley Elf (BVE).

Bench Scale Jar testing and Settlement column testing optimisation was carried out to simulate the following processes:

- Neutralisation Lime Dosing (CaO and MgO), rapid mixing and neutralising residence time
- Metal Chelating Agent/Coagulant Dosing, rapid mixing and residence time
- Flocculant Dosing and rapid mixing and residence time
- Floc formation, slow mixing and residence time
- Settling process, settling time and velocity of settled interface
- Treated Water Polishing Pond/Sump, simulated as next day settling results

(Sludge formation depth was visually observed, but Sludge Management simulation has not been tested for.)

The following chemicals and reagents were found to be the best combination for treatment of the Mean quality Raw Water (Manchester St).

- CaO – Dosed at 260g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1-1.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Flocculation time 10 minutes
- Settling Time 20-30 minutes

Other chemical combination such as CaO, SuperflocBX5 and Crystalfloc610H also achieved good settling and metals removal results. The high acidity and low acidity waters (S23 and Barren Valley ELF waters) also were able to be treated with equivalent metals removal for most metals as the mean Raw Water.

Water Quality testing with the three water samples available at Bench scale and Column settlement scale trials showed that although many of the Modified Guideline Values (GV) provided by Dr Chris Hickey, as listed in Appendix B, were able to be complied with, not all metal GV's were achieved post treatment for each test sample.

This means that further adjustment to the treatment processes is required to enable treated water qualities to achieve (or be below) the proposed GV's.

In some cases, modified Chronic Guideline Values were met for some metals to lower Level of Protection (LoP) (such as 80% and 90% LoP) but not to 95% LoP.

Aluminium and/or Cobalt were more difficult to remove with this testing, with indications that this is pH dependent.

Further testing after this report (as covered in **PFL-2408-PRO-RPT-00014 - Appendix M - Confirmation Tests_Rev0**) simulates an additional Aluminium removal process step and discusses the pH dependence of the neutralisation step in optimising metals removal.

There was some variability between the in-house spectrophotometer testing (note a spectrophotometer was used in house for some parameters to guide testing) and the Hills Laboratory testing.

Further Aluminium testing in subsequent reports is reported in the Hills laboratory tested values for consistency. Note that there will be process variability in a full-scale plant and pH and dosing control will have to be managed carefully to prevent metals being above the GV limits.

To provide reproduction of these conditions on a larger scale and with plant feed raw water quality variation sufficient to provide confidence in a full-scale plant, a pilot plant test series should be considered.

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1 INTRODUCTION

Process Flow has been engaged to provide water quality and treatment testing of Mine Influenced Waters from three sample sites to establish the requirements for water treatment systems for the proposed Mt Frederick South (MFS) and the Escarpment Extended (ESE) mining operations that form part of the Buller Plateau Continuation Project (BPCP or Project). The purpose of the testing is to treat mine influenced water to meet proposed water quality Guideline Values and Treatment Targets for discharge to waterways, leaving the sites.

During the month of August 2024 Bench Scale Jar testing and larger scale Settlement column testing has been carried out at Process Flow's premises in Richmond, Nelson.

1.1 Definition of Mine Water Quality (Plant Feed Envelope)

As part of the Jar and Settlement testing being carried out by Process Flow Limited, three existing mine water sources were chosen as samples for testing, with the intention that they would be representative of the range of water the treatment process would be required to treat water that could be seen at either ESE or MFS.

These sites are:

- Stockton "S23 monitoring location" – Maximum Water Quality (S23)
- Stockton "Manchester Street" – Mean Water Quality (MAN)
- Escarpment "Barren Valley Elf" – Minimum Water Quality (BVE)

The three water samples above are being tested for optimal Total Suspended Solids (TSS) and Metals removal on both the "as received water" and the "as received water with sediment added" to represent high TSS loading conditions.

In the testing, two loading concentrations of sediment were added to the raw water.

High sediment loading added was 3000mg/l, with Low Sediment loading at 300mg/l of sediment collected at the Mt Fred Dam site from the forebay at the top of the dam.

1.1.1 Locations of sampling

See the photos following for the three water sampling sites and one sediment sampling site.

Figure 1 S23 - Water Sample location on Stockton Mine Access Road



Figure 2 Manchester St - Water Sample Location upstream of Stockton's Lime Dosing Plant



Figure 3 Barren Valley ELF - Escarpment Mine Area



Figure 4 Z9 Pond - Sediment Sample Location Mt Fred area of Stockton



1.1.2 Raw Water Quality

Raw water test results for these three water samples can be seen below (and in Appendix A- Raw Water Quality Test Results).

Table 1 Raw Water Samples Quality

PARAMETER	UNITS	BARREN VALLEY ELF RAW WATER 29/7/24	S23 RAW WATER 29/7/24	MANCHESTER ST RAW WATER 29/7/24
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m3 as CaCO3	158	1,560	440
Total Alkalinity	g/m3 as CaCO3	< 1.0	< 1.0	< 1.0
Total Hardness	g/m3 as CaCO3	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m3	< 8	< 8	< 70
Total Solids (TS)	g/m3	300	3,400	1,000
Dissolved Aluminium	g/m3	10	168	51
Dissolved Arsenic	g/m3	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m3	0.00034	0.0026	0.00081
Dissolved Calcium	g/m3	31	169	69
Dissolved Chromium	g/m3	0.001	0.077	0.0051
Dissolved Cobalt	g/m3	0.048	0.24	0.094
Dissolved Copper	g/m3	0.0161	0.055	0.0133
Dissolved Iron	g/m3	7.1	89	13.2
Dissolved Lead	g/m3	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m3	3.2	93	24
Dissolved Manganese	g/m3	0.47	7.9	1.99
Dissolved Mercury	g/m3	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m3	0.096	0.68	0.23
Total Sodium	g/m3	2.4	4.7	4.2
Dissolved Zinc	g/m3	0.6	3.9	1.11
Chloride	g/m3	3.6	6.1	4.3
Sulphate	g/m3	186	2,400	690
Absorbance at 254 nm	AU cm-1	0.191	3.11	0.518
Transmittance at 254 nm	%T, 1 cm cell	64.4	< 0.5	30.3

1.2 Discharge Water Requirements

The treated water discharge from the MIW-WTP have been aligned with the modified (proposed) Guideline Values as provided by Chris Hickey (RMA Science) in November 2025. Treatment targets for pH, Turbidity and Total Suspended Solids have also been provided for the Project. For the purposes of assessment requirements these are as follows.

	TREATMENT TARGETS
pH	Shall not fall outside a range of 4.5 – 7.0
Total Suspended Solids	5 mg/l
Turbidity	5 NTU

	GUIDELINE VALUES
Aluminium	Chronic Guideline Values for 95%, 90% and 80% LOP
Cadmium	Chronic Guideline Values for 95%, 90% and 80% LOP
Chromium	Chronic Guideline Values for 95%, 90% and 80% LOP
Cobalt	Chronic Guideline Values for 95%, 90% and 80% LOP
Copper	Chronic Guideline Values for 95%, 90% and 80% LOP
Iron	All LOP 1 g/m3
Lead	Chronic Guideline Values for 95%, 90% and 80% LOP
Manganese	Chronic Guideline Values for 95%, 90% and 80% LOP
Nickel	Chronic Guideline Values for 95%, 90% and 80% LOP
Zinc	Chronic Guideline Values for 95%, 90% and 80% LOP
Iron + Manganese	Chronic Guideline Values for 95%, 90% and 80% LOP

A copy of the Modified Guideline Values is included in Appendix B of this report.

1.3 Process Testing Trialled

Bench Scale Jar testing and Settlement column testing optimisation was carried out to simulate the following processes.

- Neutralisation Lime Dosing (CaO and MgO), rapid mixing and neutralising residence time
- Metal Chelating Agent/Coagulant Dosing, rapid mixing and residence time
- Flocculant Dosing and rapid mixing and residence time
- Floc formation, slow mixing and residence time
- Settling process, settling time and velocity of settled interface
- Treated Water Polishing Pond/Sump, simulated by next day settling results

Sludge formation depth was visually observed but Sludge Management simulation has not been tested for.

The testing was carried out with the following reagents and chemicals:

- Neutralisation
 - MgO Magnesium Oxide
 - CaO Calcium Oxide
- Coagulants
 - Metalsorb FZA IXOM
 - SUPERFLOC BX5 1000L IXOM
- Flocculants
 - Rheomax 1050 Chemiplas
 - Crystalfloc B610H IXOM

The bench tests were performed using 1 litre of sample per test, then these tests were scaled up to column testing size of 56 times the jar testing size, using 56 litres per test.

2 BEST RESULTS SUMMARY

Jar scale testing was carried out across the three waters with and without sediment to optimise the best performing treatment process, with the best outcomes being the following combinations.

Manchester St Raw Water Sample – Bench scale test -no sediment added

- CaO – Dosed at 260g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1 g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate Bench Cylinder 0.7-0.9 m/hr & Column 4.8 m/hr (no scale factor)

Manchester St Raw Water Sample – Column scale test –3g/m³ sediment added

- CaO – Dosed at 260g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1.5 g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate Column 5.6 m/hr (no scale factor)

S23 Raw Water Sample – Column scale test –3g/m³ sediment added T4C3 & T5

- CaO – Dosed at 900g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 3 g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate 2.4 m/hr & 3.3 m/hr (no scale factor)

BVE Raw Water Sample – Column scale test –3g/m³ sediment added

- CaO – Dosed at 80g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 1g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate – No settled interface (no scale factor)

Manchester St Raw Water Sample – Column scale test –3g/m³ sediment added

- MgO – Dosed at 900g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1 g/m³ (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes

- Settlement test rate Bench scale 0.9-m/hr range, Column was cloudy, with no settled interface (no scale factor)

Manchester St Raw Water Sample – Column scale test –3g/m3 sediment added

- CaO – Dosed at 260g/m3 (neutralisation time 20 minutes mixing at 350rpm)
- Superfloc BX5 – Dosed at 10g/m3 (Flash mixed for 1 min at 350 rpm)
- Crystalfloc 610H – Dosed at 1 g/m3 (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate column 5.8 m/hr (no scale factor)

S23 Raw Water Sample – Column scale test –3g/m3 sediment added

- CaO – Dosed at 900g/m3 (neutralisation time 20 minutes mixing at 350rpm)
- Superfloc BX5 – Dosed at 30g/m3 (Flash mixed for 1 min at 350 rpm)
- Crystalfloc 610H – Dosed at 2 g/m3 (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate column 5.6 m/hr (no scale factor)

BVE Raw Water Sample – Column scale test –3g/m3 sediment added (Column Test 9)

- CaO – Dosed at 70g/m3 (neutralisation time 20 minutes mixing at 350rpm)
- Superfloc BX5 – Dosed at 5g/m3 (Flash mixed for 1 min at 350 rpm)
- Crystalfloc 610H – Dosed at 1 g/m3 (Flash mixed for 1 min at 350 rpm)
- Slow mix time of 10 minutes at 30rpm prior to settlement.
- Settlement time 30 minutes
- Settlement test rate column 5.9 m/hr (no scale factor)

3 CONCLUSIONS AND RECOMMENDATIONS

On completion of the Jar and Column scales tests it was concluded:

- Metal removal to below the proposed modified Guideline Values was achievable with a combination of CaO, Metalsorb and Rheomax, noting that not all metals were removed to below GVs for each test. (Some were elevated in Aluminium only, others in Cobalt only and others in Cobalt, Nickel, Zinc and Manganese combinations)
- Superfloc BX5 and Crystalfloc 610H also showed reasonable metals removal but not as Effectivelyas the Metalsorb and Rheomax combination
- The presence of sediment in the sample water appeared to assist with settlement of floc.
- Column Settling rates were measured and found to be as high as 5.9m/hr for settling times of 20 minutes. (Note this is a test rate and is unfactored for scale up to full plant size clarifier.)
- pH of the final supernatant was typically above the target range, so pH adjustment capability should be included in the final plant design
- Neutralisation was effective over 20 minutes retention time at Rapid Mixing speed of 350rpm (G value for Mixer Velocity gradient equivalent to 450 s^{-1}).
- Flocculation Mixing speed of 30rpm (G value for Mixer Velocity gradient equivalent to 15 s^{-1}) gave good process results. Flocculation time of 10 minutes and below produced good floc for settling.

To provide further certainty of a suitable treatment regime it is recommended:

1. consider pilot scale plant to determine repeatability and increase certainty of scaling effects
2. sludge testing/density/dewatering trials
3. further optimisation of pH adjustment in particular the acid type and location of adjustment in the process
4. further investigate the effect of polishing pond on water quality in particular metals concentrations and pH.
5. Consider further investigation/optimisation of the neutralisation, coagulation and flocculation processes

Note that subsequent testing for additional Aluminium removal processes was performed and is documented in **PFL-2408-PRO-RPT-00014 - Appendix M - Confirmation Tests_Rev0** of this report.

4 METHODOLOGY

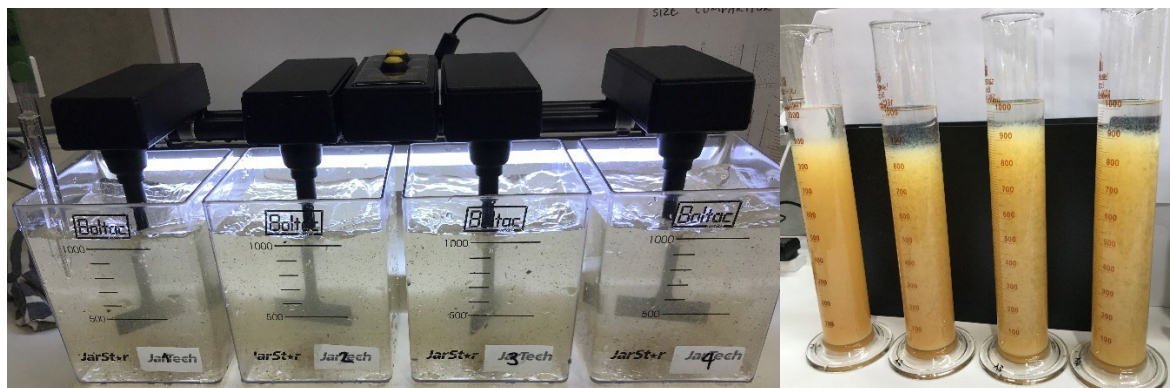
4.1 Bench Scale Process Testing Method

The following describes the detailed test method used for the bench tests discussed in this report, outlining the process stages in the bench mixing and settlement phases. Detailed dosages trialled and results are available to view in the Appendix C Detailed Test Results.

4.1.1 Bench Testing Equipment:

- A Boltac Infinity Jar Stirrer and four 1 litres jars were used for rapid and slow mixing process phases.
- Four x 1 litre glass graduated cylinders were used for bench settling tests.
- Hach DR3900 Spectrophotometer was used for dissolved metals, alkalinity and hardness testing.
- Realtech UVT meter used for UVT254 measurement
- Hanna Handheld Turbidimeter used for Turbidity measurement
- Hanna Bench top pH Meter for pH measurement

Figure 5 The Boltac Infinity jar test mixing unit and Settling Cylinders



4.1.2 Sample handling

Two IBCs of each water sample (Manchester St, S23 and Barren Valley ELF) were collected and stored in darkness at Process Flow in Richmond until testing commenced. This was to prevent temperature changes and light influence on the water prior to testing.

Preparation of the raw test water, to get a representative sample and to prevent stratification in the IBC, included mixing at the time of sampling and sampling equally from both IBCs. All jars were triple rinsed with sample water prior to test water filling.

4.1.3 Contamination prevention

To prevent metals contamination between tests, after testing each run, the jars and cylinders were cleaned with Pyroneg detergent and rinsed with deionised water.

4.1.4 Neutralisation

Neutralisation chemicals Calcium oxide and Magnesium oxide were used for the bench jar testing and column scale testing, the products used in testing below:

- Graymont High Calcium Quicklime (mixed as 20% slurry in deionised water)
- Farmguard MgO (mixed as 20% slurry in deionised water)

Test purity specifications and material safety data sheets are included in Appendix E Neutralising Agent Data.

Neutralisation was initially set to occur at rapid mix speed of 300rpm but changed to 350rpm to speed up the pH change process. Initial Neutralisation tests were trialled at up to 1 hour, but 20 minutes was found to be the optimum time with 350rpm rapid mix speed, with only slight pH change still occurring after 20 minutes.

The process used for all the subsequent neutralisation phase testing as 20 minutes rapid mix at 350rpm (Mixer Velocity Gradient G value 450 s^{-1} (r.m.s. root mean square velocity gradient)).

Measurement of pH was taken at 1, 5, 10, 15, 20 minutes during rapid mix to monitor the neutralisation phase.

4.1.5 Coagulant/Metal Chelation Agent addition

The coagulant/chelating agent products used in testing were:

- Metalsorb FZA (mixed as a 0.1% solution with deionised water)
- SuperflocBX5 (mixed as a 1.0% solution with deionised water)

After neutralisation, Coagulant addition was at the start of a 350 rpm Rapid Mixing phase for 1 minute.

4.1.6 Flocculant addition

The coagulant/chelating agent products used in testing were:

- Rheomax1050 (mixed as a 0.1% solution with deionised water)
- Crystalfloc610H (mixed as a 0.1% solution with deionised water)

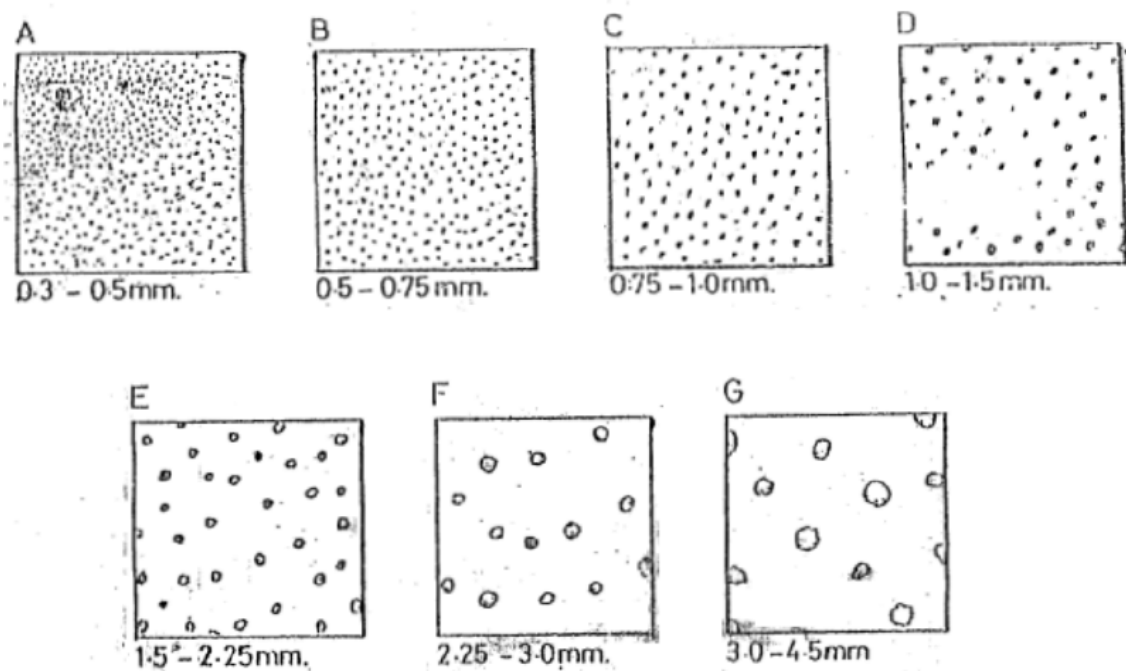
After coagulation rapid mix, Flocculant addition was during a 350 rpm Rapid Mixing phased for 1 minute.

4.1.7 Floc Formation

After flocculant addition and rapid mix, Slow mix then commenced at mixer speed 30rpm, (Mixer Velocity Gradient G value 15 s^{-1}), with a slow mix phase lasting 10 minutes.

Floc sized was noted at the start and end of the slow mix phase. Change in pH during slow mix was measured at 5 and 10 minutes.

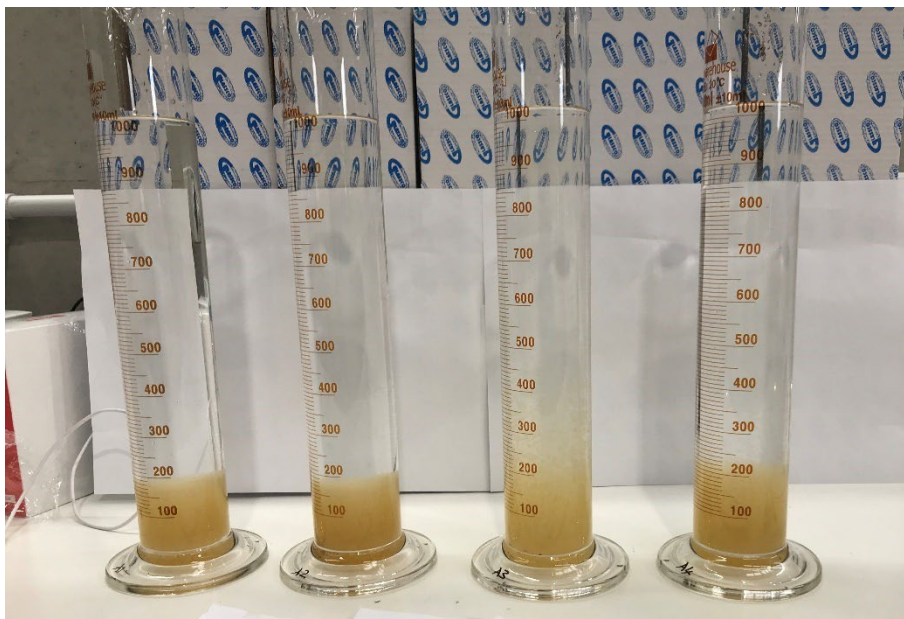
Figure 6 Floc Size Comparator



4.1.8 Settling Phase

The flocculated test waters were transferred from the 1 litre mixing jars to the settling cylinders and allowed to settle for 30 minutes, noting settled distance over time. After settling, the Supernatant was transferred into another vessel for further testing.

Table 2 Bench Scale Settling Cylinders



4.2 Column Settling Testing Method

Settling Column Testing was performed to scale up the bench testing to replicate and/or improve on the Jar Scale tests. The volume scale up was 56 times the jar testing volume. 56L of sample water was used in the column tests. The columns were 2m tall and 200mm diameter with sample points at the following heights above base: 25mm, 245mm (P3), 500mm, 755mm, 995mm (P2), 1245mm, 1500mm, 1750mm (P1). Three Perspex settling columns were set up and a 200L plastic mixing barrel with stainless steel stirrer was used to blend the reagents.

Figure 7 Settling Columns



4.2.1 Rapid and Slow Mix

The Rapid mix speed was performed at 300 rpm using a calibrated drill press and the slow mix was performed at 30 rpm manually.

As per the bench scale testing rapid mix of 20 minutes was used for neutralisation, 1 minute for coagulant addition and 1 minute for flocculant addition.

During slow mix, most tests had 10 minutes duration, but for some tests the floc formed rapidly in the mixing drum so the slow mix time was reduced or in some cases the sample was transferred immediately to the column, eliminating the slow mix phase (Column Tests T3 - 5 mins slow mix and T7, T8, T9 had no slow mix).

Figure 8 Barrel Mixer Rapid Mix

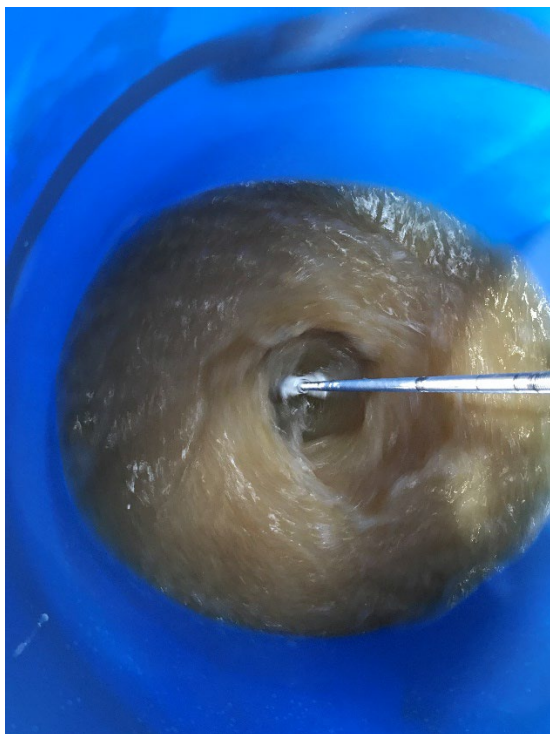
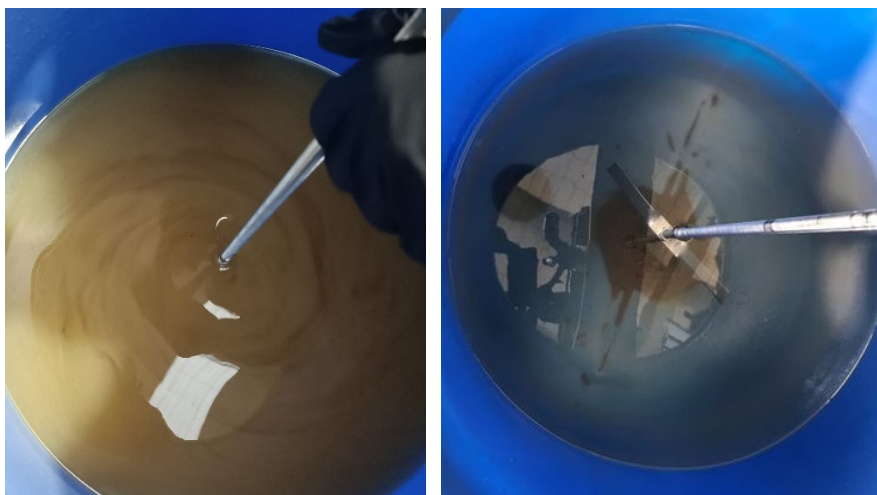


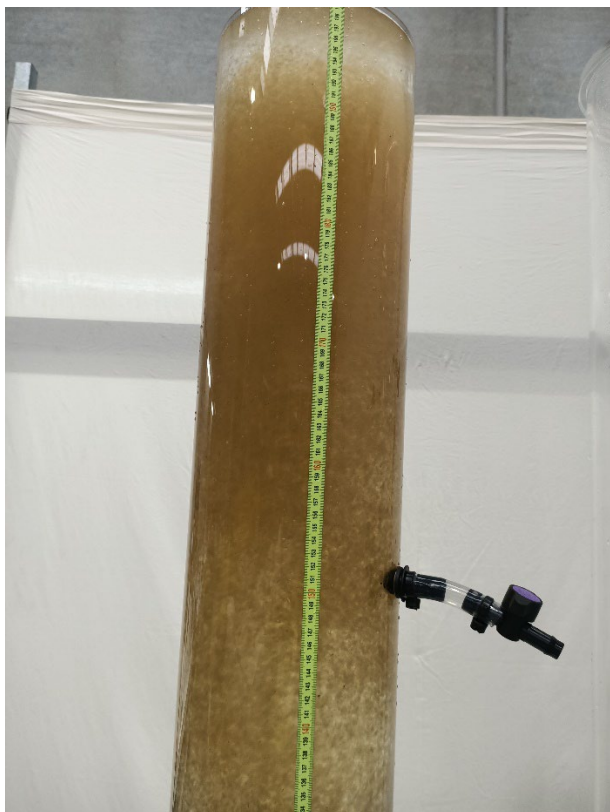
Figure 9 Slow mix suspended floc formation (Left) and Floc settling during slow mix (Right)



4.2.2 Settling

Sample was transferred to the columns by opening a 50mm ball valve at the base of the lifted mixing barrel and dropping the sample down the inside wall of the column. Despite the turbulence created by the transfer, flocs were still present in the columns following the transfer process.

Figure 10 Column Settler showing Floc reformation after water transfer



The main settling interface depth was measured, and Supernatant samples were taken at the following times during the settling phase:

5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes and 40 minutes, 60 minutes and 24 hours/Next Day.

This supernatant was then tested for Ultra Violet Transmittance (UVT), Turbidity and pH and some samples were analysed further for metals removal for the Port 1 30min samples and Next Day samples (or nearest equivalent sample).

5 DETAILED RESULTS

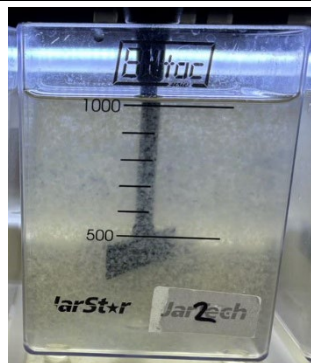
5.1 Visual Record of Floc Formation and Settling

The following section is a visual record showing the floc formation, and settling at jar scale and column scale, with associated dosing regimes.

Table 3 Manchester Street CaO No Sediment Metalsorb/Rheomax

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T3J2	Manchester St (No sediment)	1.3mL/L of 20% slurry Dose 260g/m ³ CaO	2mL/L of 0.1% soln Dose 2g/m ³ Metalsorb	1mL/L of 0.1 % soln Dose 1 g/m ³ Rheomax
Column T1C1	Manchester St (No sediment)	1.3mL/L of 20% slurry Dose 260 g/m ³ CaO	2mL/L of 0.1% soln Dose 2g/m ³ Metalsorb	1 mL/L of 0.1 % soln Dose 1 g/m ³ Rheomax

END OF SLOW MIX (10 MINS) (JAR)



Bench Settling after 5 mins	Cylinder	Bench Settling after 30 mins	Cylinder	column Settling after 5 mins	column Settling after 30 mins
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END OF SLOW MIX (10 MINS) (JAR)

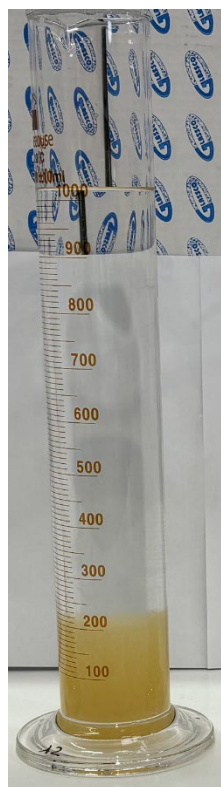


Table 4 Manchester Street MgO, Sediment, Metalsorb, Rheomax

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T6J1	Manchester St (0.3g/l sediment)	4.5mL/L of 20% slurry. Dose 900 g/m3 MgO	2mL/L of 0.1% soln Dose 2 g/m3 Metalsorb	1mL/L of 0.1 % soln Dose 1 g/m3 Rheomax
Column T2C3	Manchester St (3g/L sediment)	4.5mL/L of 20% slurry. Dose 900 g/m3 MgO	2mL/L of 0.1% soln Dose 2 g/m3 Metalsorb	1mL/L of 0.1 % soln Dose 1 g/m3 Rheomax

END OF SLOW MIX (10 MINS) (JAR)



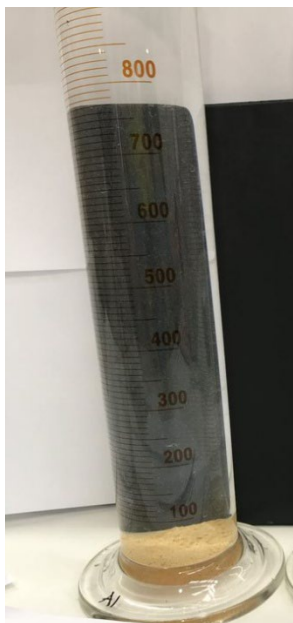
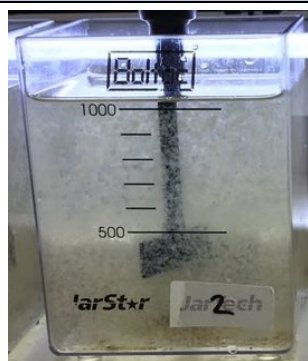
BENCH SETTLING AFTER 5 MINS	CYLINDER	BENCH SETTLING AFTER 30 MINS	CYLINDER	COLUMN AFTER 5 MINS	SETTLING	COLUMN AFTER 30 MINS	SETTLING
							

Table 5 Manchester Street CaO, Sediment, Metalsorb, Rheomax

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T4J2	Manchester St (3g/L sediment)	1.3mL/L of 20% slurry. Dose 260 g/m ³ CaO	2mL/L of 0.1% soln Dose 2 g/m ³ Metalsorb	1mL/L of 0.1 % soln Dose 1 g/m ³ Rheomax
Column T3C1	Manchester St (3g/L sediment)	1.3mL/L of 20% slurry. Dose 260 g/m ³ CaO	2mL/L of 0.1% soln Dose 2 g/m ³ Metalsorb	1.5 mL/L of 0.1 % soln Dose 1.5 g/m ³ Rheomax

END OF SLOW MIX (10 MINS) (JAR)



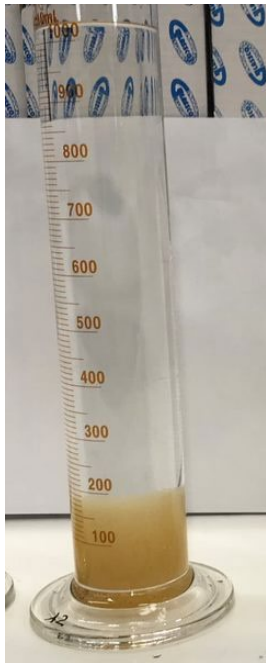
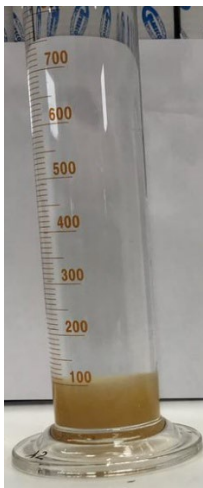
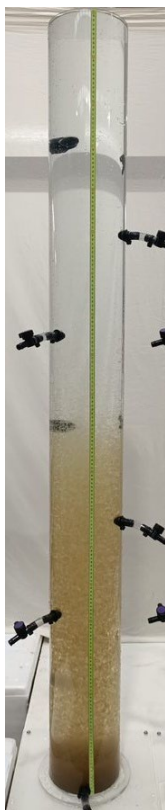
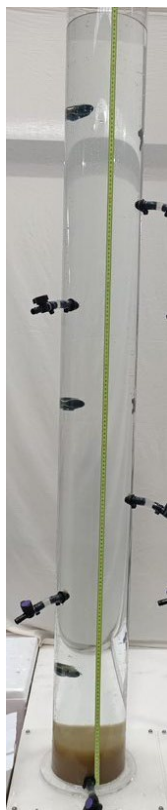
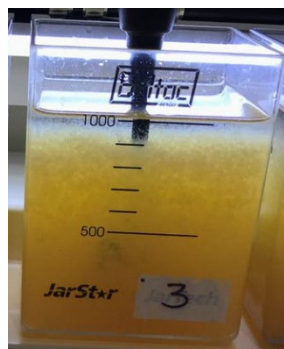
BENCH CYLINDER SETTLING AFTER 5 MINS	BENCH CYLINDER SETTLING AFTER 20 MINS	COLUMN SETTLING AFTER 5 MINS	COLUMN SETTLING AFTER 30 MINS
			

Table 6 - S23 CaO, Sediment, Metalsorb, Rheomax

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T11J3	S23 (0.3g/L sediment)	4.5 mL/L of 20% slurry. Dose 900 g/m3 CaO	2.5mL/L of 0.1% soln Dose 2.5 g/m3 Metalsorb	2mL/L of 0.1 % soln Dose 2 g/m3 Rheomax
Column T4C3	S23 (3g/L sediment)	4.55 mL/L of 20% slurry Dose 910 g/m3 CaO	2.5mL/L of 0.1% soln Dose 2.5 g/m3 Metalsorb	2mL/L of 0.1 % soln Dose 2 g/m3 Rheomax

END OF SLOW MIX (10 MINS) (JAR)



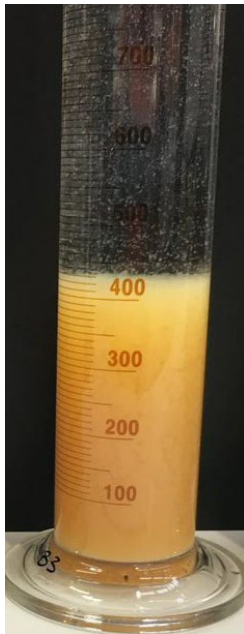
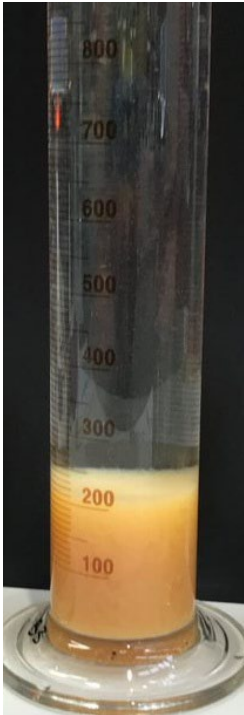
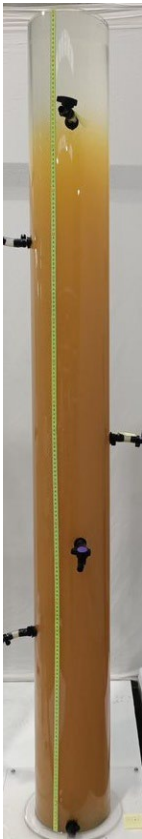
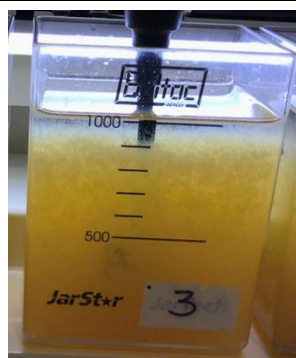
BENCH SETTLING AFTER 5 MINS	CYLINDER	BENCH SETTLING AFTER 20 MINS	CYLINDER	COLUMN AFTER 5 MINS	SETTLING	COLUMN AFTER 30 MINS	SETTLING
							

Table 7 - S23 CaO, Sediment, Metalsorb, Rheomax

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T11J3	S23 (0.3g/L sediment)	4.5 mL/L of 20% slurry. Dose 900 g/m3 CaO	2.5mL/L of 0.1% soln Dose 2.5 g/m3 Metalsorb	2mL/L of 0.1 % soln Dose 2 g/m3 Rheomax
Column T5C2	S23 (3g/L sediment)	4.55 mL/L of 20% slurry Dose 910 g/m3 CaO	2.5mL/L of 0.1% soln Dose 2.5 g/m3 Metalsorb	3mL/L of 0.1 % soln Dose 3 g/m3 Rheomax

END OF SLOW MIX (10 MINS) (JAR)



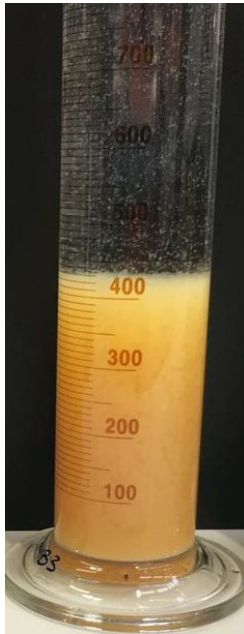
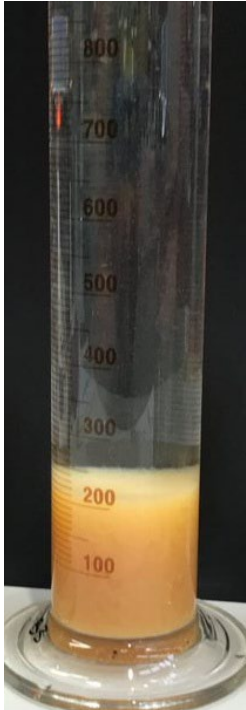
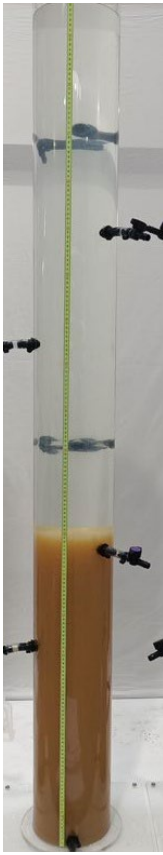
BENCH CYLINDER SETTLING AFTER 5 MINS	BENCH CYLINDER SETTLING AFTER 20 MINS	COLUMN SETTLING AFTER 5 MINS	COLUMN SETTLING AFTER 30 MINS
			

Table 8 - BVE (Barron Valley ELF), CaO, Sediment, Metalsorb, Rheomax

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T15JS2	BVE (3g/L Sediment)	0.4mL/L of 20% slurry. Dose 80 g/m3 CaO	1mL/L of 0.1% soln Dose 1 g/m3 Metalsorb	1mL/L of 0.1 % soln 1 g/m3 Rheomax
Column T6C3	BVE (3g/L Sediment)	0.35mL/L of 20% slurry. Dose 70 g/m3 CaO	1mL/L of 0.1% soln Dose 1 g/m3 Metalsorb	1mL/L of 0.1 % soln 1 g/m3 Rheomax

END OF SLOW MIX (10 MINS) (JAR)



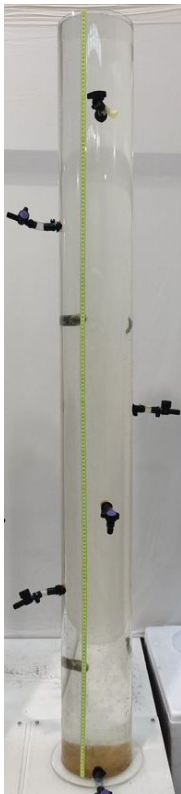
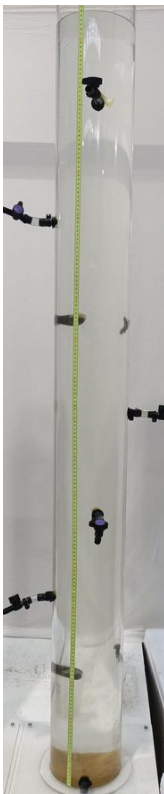
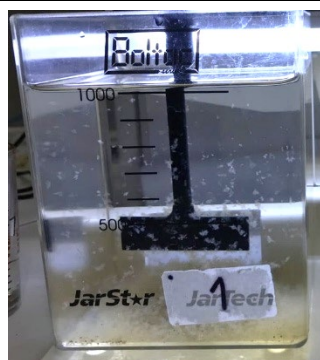
BENCH CYLINDER SETTLING AFTER 5 MINS	BENCH CYLINDER SETTLING AFTER 20 MINS	COLUMN SETTLING AFTER 5 MINS	COLUMN SETTLING AFTER 30 MINS
			

Table 9 - Manchester Street CaO, Sediment, Superfloc BX5, Crystalfloc 610H

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T17J1	Manchester St (3g/L sediment)	1.3mL/L of 20% slurry. Dose 260 g/m ³ CaO	1mL/L of 1% soln Dose 10 g/m ³ Superfloc BX5	1 mL/L of 0.1% soln. Dose 1 g/m ³ Crystalfloc 610H
Column T7C3	Manchester St (3g/L sediment)	1.3mL/L of 20% slurry. Dose 260 g/m ³ CaO	1mL/L of 1% soln Dose 10 g/m ³ Superfloc BX5	1 mL/L of 0.1% soln. Dose 1 g/m ³ Crystalfloc 610H

END OF SLOW MIX (10 MINS) (JAR)



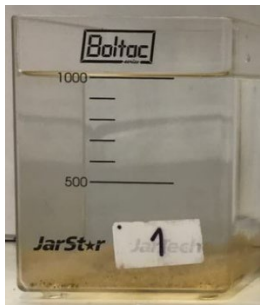
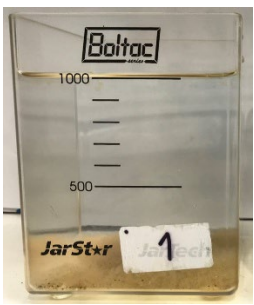
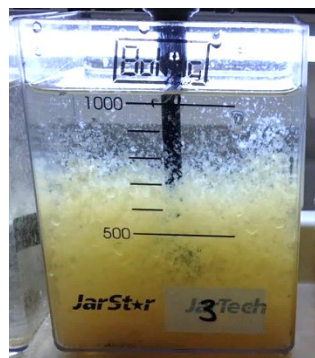
BENCH SETTLING AFTER 5 MINS	CYLINDER SETTLING AFTER 30 MINS	COLUMN AFTER 5 MINS	SETTLING AFTER 30 MINS
			

Table 10 - S23 CaO, Sediment, Superfloc BX5, Crystalfloc 610H

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T19J3	S23 (3g/L sediment)	4.5mL/L of 20% slurry. Dose 900 g/m3 CaO	3mL/L of 1% soln Dose 30 g/m3 Superfloc BX5	2 mL/L of 0.1% soln. Dose 2 g/m3 Crystalfloc 610H
Column T8C2	S23 (3g/L sediment)	4.5mL/L of 20% slurry. Dose 900 g/m3 CaO	3mL/L of 1% soln Dose 30 g/m3 Superfloc BX5	2 mL/L of 0.1% soln. Dose 2 g/m3 Crystalfloc 610H

END OF SLOW MIX (10 MINS) (JAR)



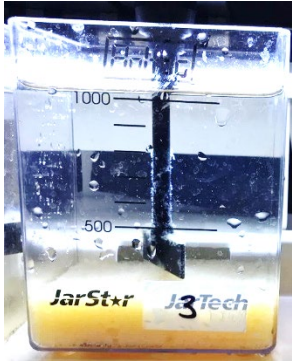
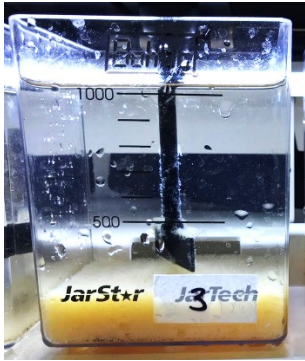
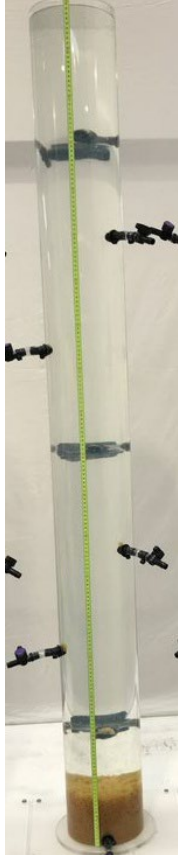
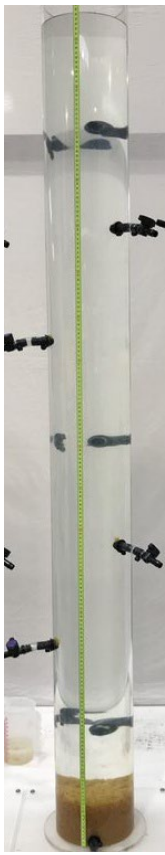
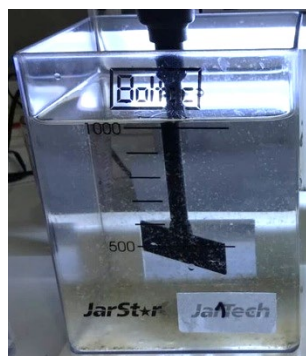
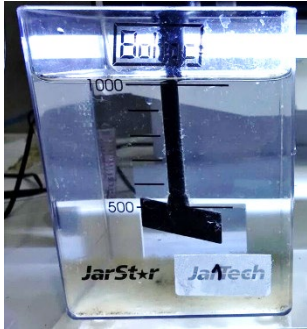
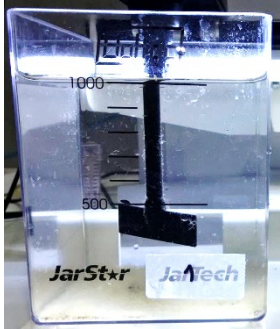
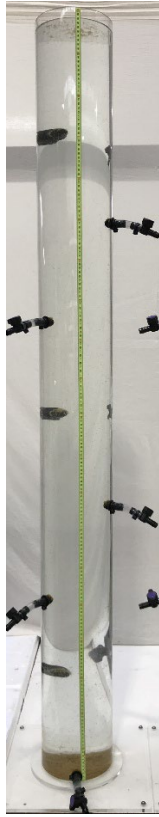
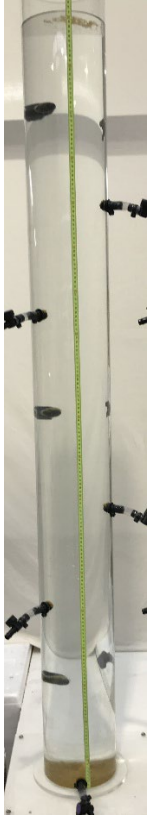
BENCH SETTLING AFTER 5 MINS	CYLINDER	BENCH SETTLING AFTER 10 MINS	CYLINDER	COLUMN SETTLING AFTER 5 MINS	SETTLING	COLUMN SETTLING AFTER 20 MINS	SETTLING
							

Table 11 - BVE, CaO, Sediment, Superfloc BX5, Crystalfloc 610H

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T19J1	BVE (3g/L sediment)	0.35mL/L of 20% slurry. Dose 70 g/m3 CaO	0.5mL/L of 1% soln Dose 5 g/m3 Superfloc BX5	1 mL/L of 0.1% soln. Dose 1 g/m3 Crystalfloc 610H
Column T9C1	BVE (3g/L sediment)	0.35mL/L of 20% slurry. Dose 70 g/m3 CaO	0.5mL/L of 1% soln Dose 5 g/m3 Superfloc BX5	1 mL/L of 0.1% soln. Dose 1 g/m3 Crystalfloc 610H

END OF SLOW MIX (10 MINS) (JAR)



BENCH CYLINDER SETTLING AFTER 5 MINS	BENCH CYLINDER SETTLING AFTER 30 MINS	COLUMN SETTLING AFTER 5 MINS	COLUMN SETTLING AFTER 30 MINS
			

5.1.1 Bench Test Settling Rates

Settling distance over time was recorded for both bench and column tests. The bench tests are shown in figure 11 below for bench scale settling cylinders. Overall, the testing showed bench scale settling rates of between 245-315mm in 20 minutes (0.7-0.9m/hour).

Overview of Jar and Cylinder Settling Distances at 5min and 20 mins
For Raw Water Type/Neutralent/Coagulant/Flocculant at various dosages

The graph displays two data series: Distance Settled After 5 min mm (blue line) and Distance Settled After 20 min mm (red line). The Y-axis represents Distance Settled in mm, ranging from 0.00 to 350.00. The X-axis lists various water types and dosages, including MAN CaO MR, MAN CaO MR, MAN CaO MR, MAN CaO MR, MAN CaO MR, MAN CaO MR, MAN MgO MR, MAN MgO MR, MAN MgO/CaO MR, MAN MgO/CaO MR, S23 CaO MR, S23 CaO MR, S23 CaO MR, S23 CaO MR, S23 MgO MR, S23 MgO MR, S23 MgO MR, S23 MgO MR, MAN CaO MR, MAN CaO MR, BVE CaO MR, BVE CaO MR, MAN CaO SC, MAN CaO SC, BVE CaO SC, and S23 CaO SC.

Legend:

- Distance Settled After 5 min mm
- Distance Settled After 20 min mm

MAN	Manchester St Raw water
S23	S23 Raw Water
BVE	Barren Valley ELF Raw water
MR	Metalsorb/Rheomax coagulant/flocculant combination
SC	Superfloc/Crystalfloc coagulant/flocculant combination
CaO	Calcium Oxide Neutralant
MgO	Magnesium Oxide Neutralant

5.1.2 Column Settling rates

Settled floc interface settling rates in column tests were measured as distance from water surface to the main floc interface over time. Below shows results from the nine column tests. The MgO test (Column Test 2) produced no settled interface and cloudy water. Test 1, 3, 4 and 5 produced well defined settled floc interfaces with MetalsorbFZ and Rheomax 1050. Tests 7, 8 and 9 were with Superfloc BX5 and Crystalfloc610H, and settled quickly with the main interface settling in around 10 minutes, but there were large amounts of floating floc, which had mainly cleared by 20-30 mins.

Note that test settle rates shown below are unfactored trial rates, and that to convert these to full scale settling clarifiers required adding scaling factors that reduce these numbers down.

Table 12 Column Settlement Rates m/hr (test rates unfactored for scale up)

	T1 C1	T2 C3	T3 C1	T4 C3	T5 C2	T6 C3	T7 C3	T8 C2	T9 C1
	Replic T3J2	Replic T6J1		T11J3 Replic	T11J3 Replic	T15J4 less CaO			
	MAN/ CaO	MAN/ MgO	MAN /CaO	S23	S23	BVE	MAN	S23	BVE
Settlement rate at 20mins	4.8	Not settling/ Cloudy	5.61	2.385	3.285	No Settled interface	5.76	5.61	5.94
Settlement rate at 25mins	3.84		4.536	2.112	2.796				
Settlement rate at 30mins	3.4		3.79	1.87	2.43				

Rates of up to 5.6m/hr settling velocity were achieved for Manchester St water with both sets of coagulant/flocculant types. However, the Metalsorb/Rheomax combination all metals were reduced to below the modified chronic guideline values except for cobalt which did not meet the 95% and 90% GVs but did meet the 80% GV.

For the Superfloc/Crystalfloc combination, in the Column test, all metals except Cobalt were reduced to below the modified Chronic Guideline Values for 80% and 90% LoP. Cobalt did not comply with 95%, 90% and 80% GVs. Manganese and Nickel did not comply with the 95% LoP GV. Suspended solids was slightly elevated (6mg/l) from the treated target, of 5mg/l.

The best settling rate for S23 with Metalsorb/Rheomax was 3.3m/hr in Test 5, which had increased Rheomax dosing. In the Column Test, most metals were reduced to below the modified Guideline Values except Aluminium. There was however a 99.4% reduction in aluminium. The suspended solids and pH were also elevated above the treatment targets.

For S23, in Test 8 using Superfloc/Crystalfloc combination settling rate was 5.6m/hr. All Metals were removed to below the modified Chronic Guideline Values for all three LoP (95%, 90% and 89% LoP). Suspended solids and pH were elevated above the treatment targets.

Barren Valley ELF did not work well with Metalsorb/Rheomax in the Column whereas at jar scale it had settled well. In the Column test Cobalt, Nickel and Zinc did not meet the modified Guideline Values and pH and suspended solids were slightly elevated above the treatment targets.

However, with Superfloc/Crystalfloc rapid settling occurred at 5.9m/hr. In the column test, all Metals were removed to below the modified Chronic Guideline Values except for Aluminium for the 90% and 95% LoP and Cobalt for the 95% LoP. Suspended solids and pH were slightly elevated above the treatment targets.

5.1.3 Physical Settling Testing

Physical comparison of settling effectiveness was done with in house turbidity and UVT measurement on supernatant. Total suspended solids testing was done via external laboratory testing. The turbidity and suspended solids Treated Targets limits are below.

Table 13 TSS and Turbidity Limits

PARAMETER	TREATED TARGETS
pH	Shall not fall outside a range of 4.5-7
Total Suspended Solids	5mg/l
Turbidity	5NTU

The results of three column tests performed on Manchester St Raw Water can be seen below. The column test dosing combinations were:

T1C1 - Manchester St Raw – no sediment added, CaO, Metalsorb/Rheomax

T3C1 - Manchester St Raw – 3000mg/l sediment added, CaO, Metalsorb/Rheomax (higher dose)

T7C3 - Manchester St Raw – 3000mg/l sediment added, CaO, Superfloc BX5/Crystafloc 610H

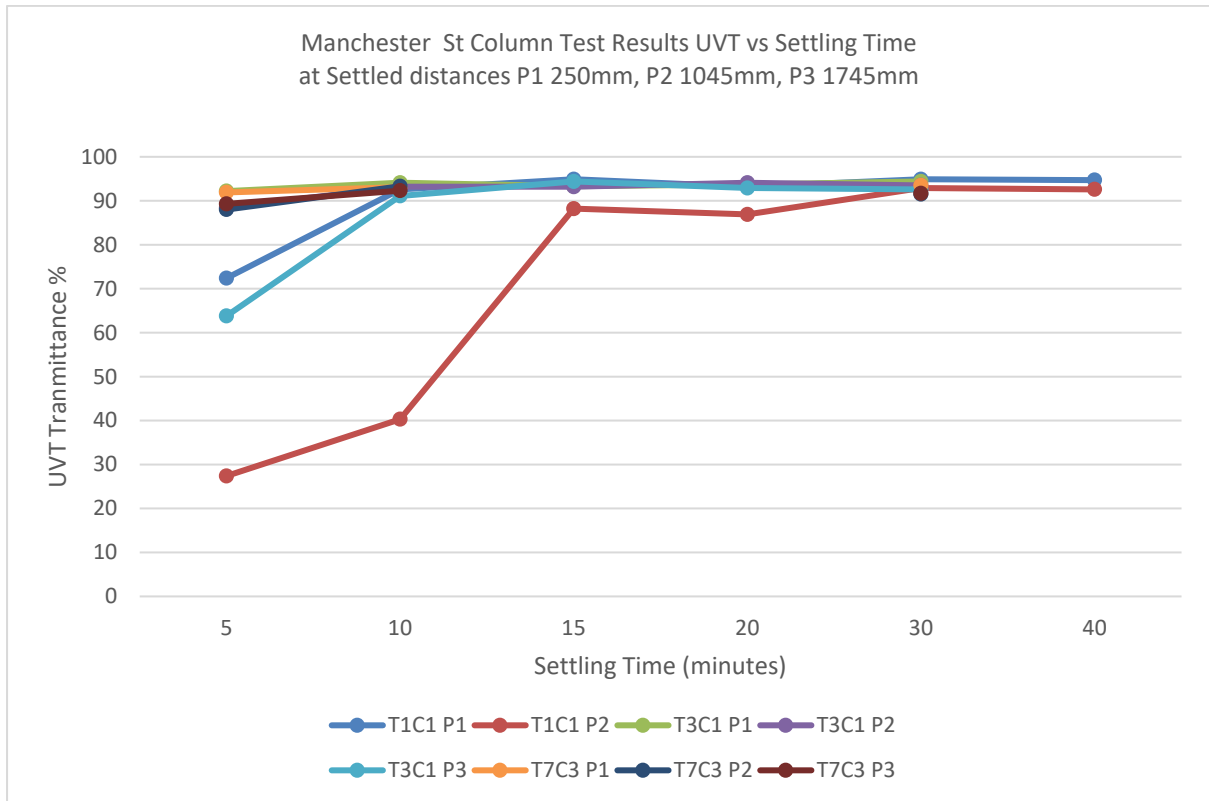
Effectiveness of settling was gauged visually and but testing Ultraviolet Transmittance at 254nm (UVT₂₅₄) and Turbidity as methods for determining differences in water visual clarity, particulate and dissolved material removal and colour at three depths within the columns.

Port 1 at 250mm below the water surface, with Port 2 at 1045mm and Port 3 at 1745mm depths. (P1, 2 and 3 in the graph below).

Samples taken from Port 1 were tested for metals.

It can be seen in figure 12 that by 15 minutes all three tests had good visual clarity down to a settling depth of 1745mm and UVT above 80%, with the Metalsorb/Rheomax results both being above 90%.

Figure 12 Manchester UVT vs Settling Time



Turbidity at 20 minutes for all three column tests was below 5NTU for all port levels.

Figure 13 Manchester Turbidity vs Settling Time

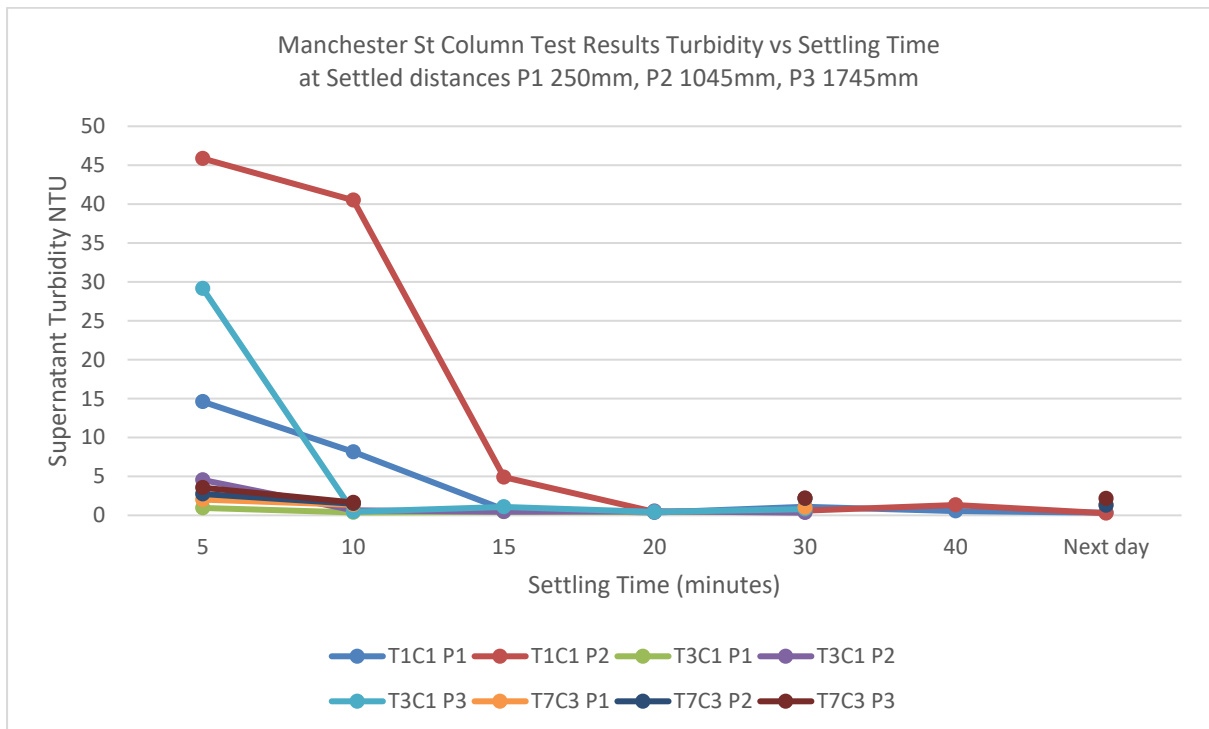


Figure 14 S23 UVT vs Settling Time

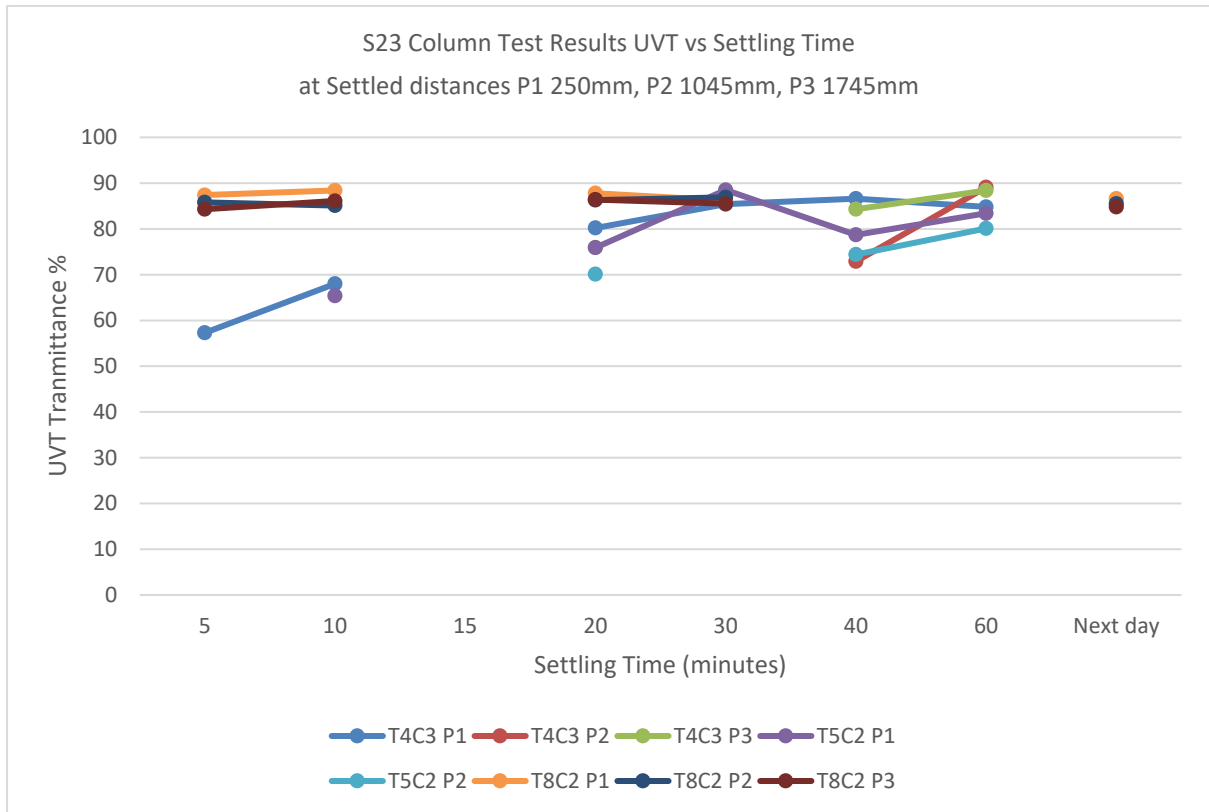


Figure 15 S23 vs Settling Time

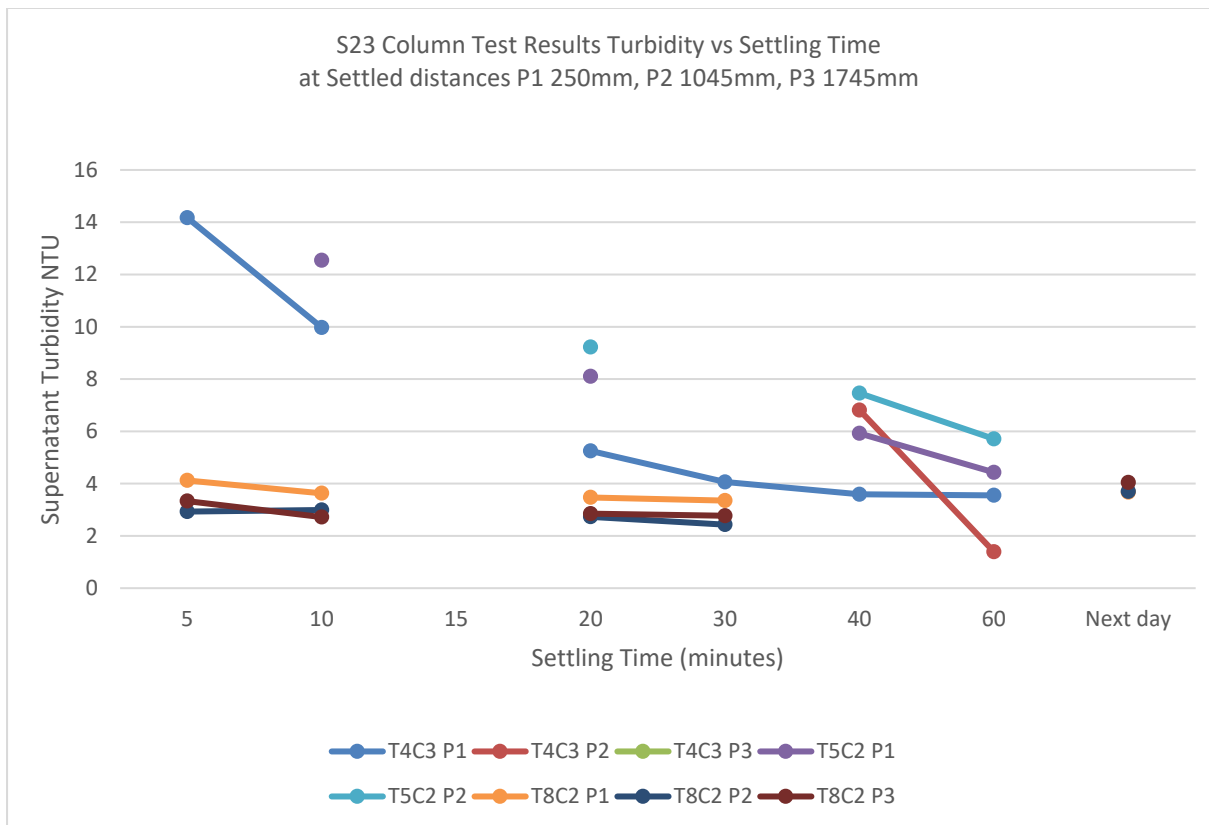


Figure 16 Barren Valley ELF UVT vs Settling Time

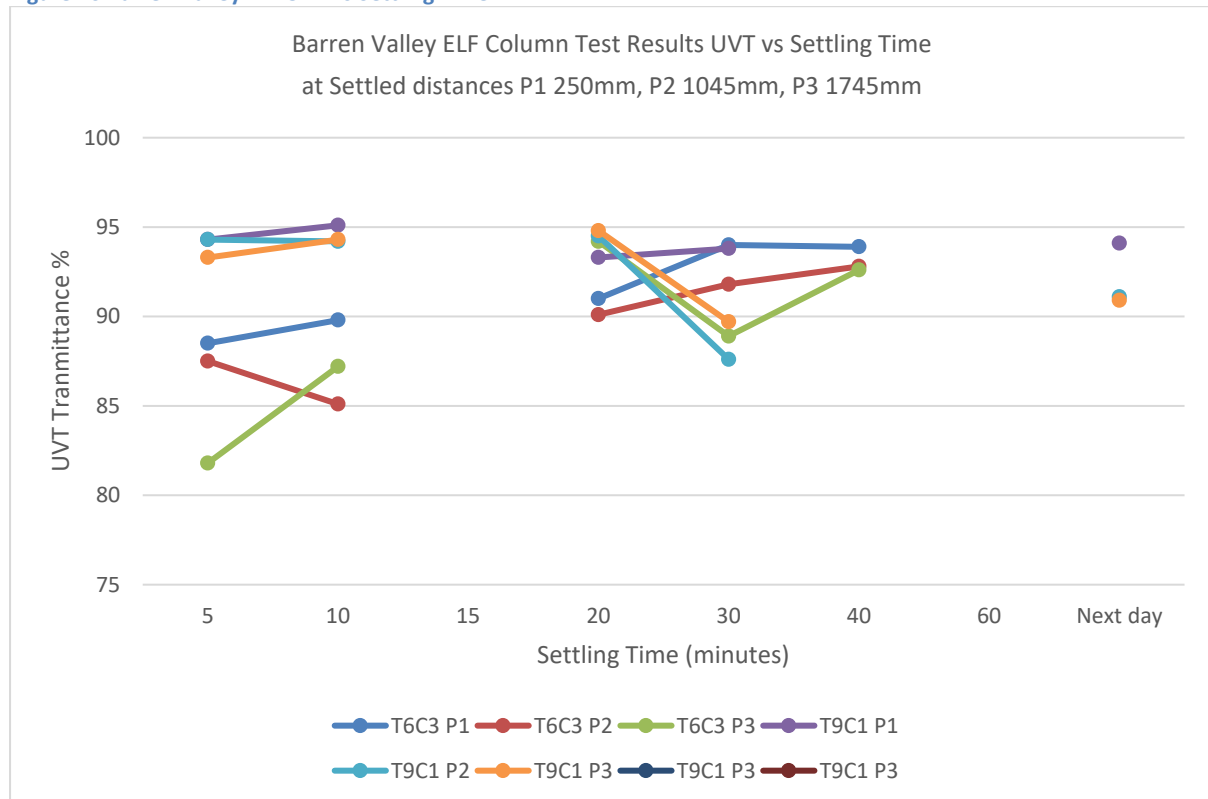
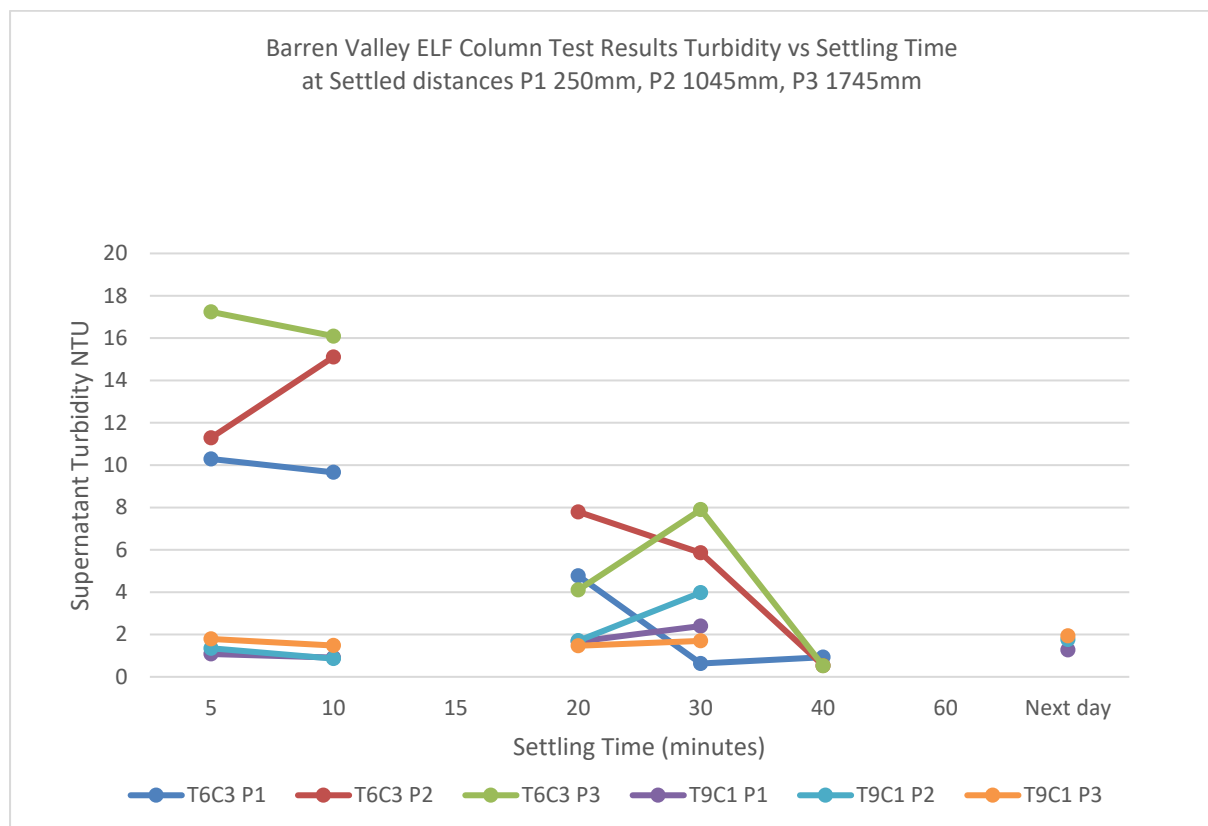


Figure 17 Barren Valley ELF Turbidity vs Settling Time



5.2 Suspended Solids Results

The Treated (water quality) Target for Total Suspended Solids is 5mg/l.

Testing of settled supernatant shows this treated target is able to be met for some of the test results only. Five out of nine Manchester tests met the target, two out of six S23 tests and two out of five Barren Valley Elf tests met the target.

All results are below 10mg/L except for the S23 at 60 mins column settling with the combination of CaO, Metalsorb/Rheomax and S23 with 30 minutes column settling with the combination of CaO, Superfloc/Crystalfloc, see results below.

Table 14 Supernatant Suspended Solids tests

SAMPLE	MAN RAW	MAN T6J2	MAN T3J2	MAN T1C1 15MIN	MAN T1C1 30MIN	MAN T3C1 15MIN P1	MAN T3C1 30MIN P1	MAN T3C1 NEXT DAY	MAN T7C3 30 MIN P1	MAN T7C3 NEXT DAY P1
Suspended Solids mg/l	<70	< 3	5	6	7	5	5	6	6	4

SAMPLE	S23 RAW	S23 CAO MR T13J4	S23 CAO MRT14S1	S23 CAO MR T5C2 60MIN P1	S23 CAO MR T5C2 NEXTDAY P1	S23 CAO SC T8C2 30MIN P1	S23 CAO SC T8C2 NEXT DAY P1
Suspended Solids mg/l	<8	< 3	< 3	16	9	12	8

SAMPLE	BVE RAW	BVE T15S2	BVE T6C3 40 MIN P1	BVE T6C3 NEXT DAY P1	BVE T9C1 30MIN P1	BVE T9C1 NEXT DAY P1
Suspended Solids mg/l	<8	3	9	4	6	6

5.3 Supernatant Dissolved Metals and pH

The tables below summarise the metals laboratory testing results for tests conducted on the selected best treatment scenarios from bench tests and column tests. The column tests were generally a repeat of the jar scale tests but, in some cases, had minor dosing adjustments to optimise the result. The matching sets of jar and column tests have been summarised below and in the following tables. The pH levels for the treatment after rapid mix and at supernatant stage are itemised here too.

The various treatment scenarios and results were:

- Manchester St without Sediment + CaO + Metalsorb + Rheomax (Test 3 Jar 2 & Test 14 Sample 2 and Column Test 1 C1)**

The pH after flocculant rapid mix was pH 8.56 and at supernatant stage was pH 7.7. The Column test pH after flocculant rapid mix was pH 7.55 and at supernatant stage was pH 7.5.

All dissolved metals were below modified chronic guideline values except for Aluminium. Other treatment target parameters pH and total suspended solids were slightly elevated, but turbidity was well within the treatment target.

- Manchester St with Sediment + CaO + Metalsorb + Rheomax (T4Jar2 and Column Test 3C1)**

The pH after flocculant rapid mix was pH 8.19 and at supernatant stage was pH 6.98. The Column test pH after flocculant rapid mix was pH 7.55 and at supernatant stage was pH 6.98.

All metals were reduced to below the modified chronic guideline values except for cobalt which did not meet the 95% and 90% GV's but did meet the 80% GV.

- S23 with Sediment + CaO + Metalsorb + Rheomax (Test 11 Jar 3/Test 14 S1 and Test 5 Column 2)**

The Bench Test 11 pH after flocculant rapid mix was pH 6.81/7.3 and at supernatant stage was pH 6.87.

The Column test pH after flocculant rapid mix was pH 8.9 and at supernatant stage was pH 8.1.

In the Column Test, most metals were reduced to below the modified Guideline Values except Aluminium. There was however a 99.4% reduction in aluminium. The suspended solids and pH were also elevated above the treatment targets.

In the Jar test Cobalt, Manganese, Nickel and Iron+Manganese were above the modified chronic guideline values.

Where Jar test Cobalt is above the GV, the chelating agent may have caused interference. Iron was reduced by 100% but Manganese only by 53.2%. The column scale test was at a higher sediment loading than the similar Jar test whilst the Chelating agent dose was held the

same. Further optimisation is necessary to improve metals removal at the higher sediment load. Iron + Manganese was above modified Guideline Values in the Jar test caused by high Manganese. This could be due to the lower supernatant pH (6.6).

- **Barren Valley ELF with Sediment + CaO + Metalsorb + Rheomax (T15S2, T6C3)**

The Bench Test 15 pH after flocculant rapid mix was pH 8.7 and at supernatant stage was pH 8.74.

The Column Test 6 pH after flocculant rapid mix was pH 6.75 and at supernatant stage was pH 7.2.

In the Jar test, Cobalt and Aluminium did not meet the modified chronic guideline values and pH was elevated above the treatment target.

The Turbidity treatment target was met for both Jar and Column tests.

In the Column test Cobalt, Nickel and Zinc did not meet the modified Guideline Values and pH and suspended solids were slightly elevated above the treatment targets.

- **Manchester St with Sediment + MgO + Metalsorb + Rheomax (T6J1/T2C3)**

The Bench Test 6 pH after flocculant rapid mix was pH 8.5 and at supernatant stage was pH 7.2.

The Column Test 2 pH after flocculant rapid mix was pH 8.19 and at supernatant stage was pH 8.01.

In the Jar test all metals except Cobalt were reduced to below the modified Chronic Guideline Values. The 80% LoP Chronic GV for Cobalt was met, but not the 95% or 90% LoP GV.

The column test was not sampled due to visual observation of lack of settling in the column.

- **Manchester St with Sediment + CaO + SuperflocBX6 + CrystalFloc 610H – (T17J1 and T7C3).**

The Bench Test 11 pH after flocculant rapid mix was pH 8.28 and at supernatant stage was pH 8.35.

The Column test pH after flocculant rapid mix was pH 8.19 and at supernatant stage was pH 6.98.

In the Column test all metals except Cobalt were reduced to below the modified Chronic Guideline Values for 80% and 90% LoP. Cobalt did not comply with 95%, 90% and 80% GV. Manganese and Nickel did not comply with the 95% LoP GV. Suspended solids was slightly elevated (6mg/l) from the treated target, of 5mg/l.

- **S23 with Sediment + CaO + SuperflocBX6 + CrystalFloc 610H – (T19J3 and T8C2).**

The Bench Test 19 pH after flocculant rapid mix was pH 7.04 and at supernatant stage was pH 6.81.

The Column test 8 pH after flocculant rapid mix was pH 7.68 and at supernatant stage was pH 7.3.

All Metals were removed to below the modified Chronic Guideline Values for all three LoP (95%, 90% and 80% LoP).

Suspended solids and pH were elevated above the treatment targets.

- **Barren Valley ELF with Sediment + CaO + SuperflocBX6 + CrystalFloc 610H – (T19J1 and T9C1).**

The Bench Test 19 pH after flocculant rapid mix was pH 5.73 and at supernatant stage was pH 6.32.

The Column test 9 pH after flocculant rapid mix was pH 7.56 and at supernatant stage was pH 7.7.

In the column test, all Metals were removed to below the modified Chronic Guideline Values except for Aluminium for the 90% and 95% LoP and Cobalt for the 95% LoP.

Suspended solids and pH were slightly elevated above the treatment targets.

5.3.1 Metals Testing – Inhouse Test Methods

To provide a rapid assessment and identify the best metals removals at the jar scale, in house testing was carried out on a selection of metals plus Hardness and Alkalinity.

In house testing of metals was performed on the best visual results from jar tests and some column tests. This provided a quick reference to check if jar testing performance was adequate for compliance with treatment targets and to inform process decisions for further tests. In house test results can be seen on Appendix C Detailed Test Results sheets.

The testing was carried out using a Hach DR3900 Spectrophotometer and Standard Methods prescribed by Hach.

The following Standard Hach Test methods were used:

- Total Alkalinity - Method 10239 Colorimetric Method TNT 870 – measurement wavelength 615nm.
- Water Hardness – Metal Phthalein Colorimetric Method 10293 TNT 869. Measurement wavelength 572nm
- Aluminium– Chromazurol S Method 10215 - TNT848 - measurement wavelength 620nm
- Nickel – PAN Method 8150. Measurement wavelength 560nm
- Cobalt – Method 8078 – PAN Method. Measurement wavelength 620nm
- Iron - Phenanthroline Method 10229 - TNT 858. Measurement wavelength 515nm.
- Manganese – Periodate Oxidation Method 8034 – Measurement wavelength 525nm

The treated supernatant results from the Hills Laboratory testing generally fell within the 95% confidence interval for precision for the Hach standard methods.

5.4 General Comment

Metals removal to the modified Chronic Guideline Values was achieved in some cases only. In some cases, modified Chronic Guideline Values were met for some metals to lower LoP but not others. Aluminium and/or Cobalt were more difficult to remove with this testing, with indications that this is

pH dependent. Further testing after this report (as covered in **PFL-2408-PRO-RPT-00014 - Appendix M - Confirmation Tests_Rev0**) simulates an additional Aluminium removal process step and discusses the pH dependence of the neutralisation step in optimising metals removal.

There was some variability between the in-house testing and the Hills Laboratory testing.

For example, for the Manchester+sediment/CaO/Metalsorb/Rheo combination, the Aluminium in T4J2 test (inhouse metals analysis) and the C1T3 (hills analysis) is lower than T3J2 and T14S2 (analysis done at Hills). This is shown in the table below.

Further Aluminium testing has is carried out in subsequent tests and reported in Appendix M. Note that there will be process variability in a full-scale plant and pH and dosing control will have to be managed carefully to prevent metals being above the GV limits.

Table 15 - Hills Test vs In House Test

TEST	AL G/M3	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench Test Test 4 Jan 2 16/8/2024	0.161	Manchester St (3g/L sediment)	1.3mL/L of 20% slurry 260 g/m3 CaO	2mL/L of 0.1% soln 2 g/m3 Metalsorb	1mL/L of 0.1 % soln 1 g/m3 Rheomax
Column Test 3 C 1 29/8/2024	0.13	Manchester St (3g/L sediment)	1.3mL/L of 20% slurry 260 g/m3 CaO	2mL/L of 0.1% soln 2 g/m3 Metalsorb	1.5 mL/L of 0.1% soln 1.5 g/m3 Rheomax
Bench Test Test 3 Jan 2 15/8/2024	0.93	Manchester St (No sediment)	1.3mL/L of 20% slurry 260 g/m3 CaO	2mL/L of 0.1% soln 2 g/m3 Metalsorb	1mL/L of 0.1 % soln 1 g/m3 Rheomax
Column Test 1 C 1 28/8/2024	0.79	Manchester St (No sediment)	1.3mL/L of 20% slurry 260 g/m3 CaO	2mL/L of 0.1% soln 2 g/m3 Metalsorb	1 mL/L of 0.1% soln 1 g/m3 Rheomax

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 16 Manchester St, no sediment, CaO, Metalsorb, Rheomax (T3J2/T14S2 & T1C1)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	0.86	1.2	19.8		
Turbidity Target	NTU	5	5			
pH	pH Units	7.7	7.5	3.2		
pH Target	pH Units	4.5-7	4.5-7			
Total Alkalinity	g/m3 as CaCO3	14.7	17.2	<1		
Total Hardness	g/m3 as CaCO3	630	650	270		
Total Suspended Solids	g/m3	5	7	<70		
TSS Target	g/m3	5	5			
Dissolved Aluminium	g/m3	0.93	0.79	51	98.2	93.9
Dissolved Aluminium Chronic GV 95%	g/m3	0.48	0.44			
Dissolved Aluminium Chronic GV 90%	g/m3	0.61	0.56			
Dissolved Aluminium Chronic GV 80%	g/m3	0.83	0.76			
Dissolved Cadmium	g/m3	< 0.00005	0.00005	0.00081	93.8	-134.4
Dissolved Cadmium Chronic GV 95%	g/m3	0.00037	0.00037			
Dissolved Cadmium Chronic GV 90%	g/m3	0.00069	0.00069			
Dissolved Cadmium Chronic GV 80%	g/m3	0.00155	0.00155			
Dissolved Calcium	g/m3	220	220	69		-1620.0
Dissolved Chromium	g/m3	< 0.0005	0.0005	0.0051	90.2	90.0
Dissolved Cobalt	g/m3	0.0026	0.0025	0.094	97.2	98.5
Dissolved Cobalt Chronic GV 95%	g/m3	0.0033	0.0033			
Dissolved Cobalt Chronic GV 90%	g/m3	0.0078	0.0078			
Dissolved Cobalt Chronic GV 80%	g/m3	0.0208	0.0208			
Dissolved Copper	g/m3	< 0.0005	< 0.0005	0.0133	96.2	93.8
Dissolved Copper Chronic GV 95%	g/m3	0.0016	0.0016			
Dissolved Copper Chronic GV 90%	g/m3	0.0020	0.0019			
Dissolved Copper Chronic GV 80%	g/m3	0.0032	0.0030			
Dissolved Iron	g/m3	< 0.02	0.02	13.2	99.8	-30.2

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Iron Chronic GV 80%/90%/95%	g/m3	1	1			
Dissolved Lead	g/m3	< 0.00010	0.0001	0.00136		90.2
Dissolved Magnesium	g/m3	22	23	24		97.3
Dissolved Manganese	g/m3	0.49	0.49	1.99	75.4	96.2
Dissolved Manganese Chronic GV 95%	g/m3	1.22	1.24			
Dissolved Manganese Chronic GV 90%	g/m3	1.88	1.90			
Dissolved Manganese Chronic GV 80%	g/m3	3.07	3.11			
Dissolved Nickel	g/m3	0.0115	0.0117	0.23	95	99.8
Dissolved Nickel Chronic GV 95%	g/m3	0.099	0.099			
Dissolved Nickel Chronic GV 90%	g/m3	0.118	0.118			
Dissolved Nickel Chronic GV 80%	g/m3	0.154	0.154			
Dissolved Zinc	g/m3	< 0.0010	< 0.0010	1.11	99.9	92.6
Dissolved Zinc Chronic GV 95%	g/m3	0.067	0.077			
Dissolved Zinc Chronic GV 90%	g/m3	0.100	0.115			
Dissolved Zinc Chronic GV 80%	g/m3	0.172	0.198			
Dissolved Organic Carbon (DOC)	g/m3	1.6	1.5			
Absorbance at 254 nm	AU cm-1	0.013	0.008	0.518		
Transmittance at 254 nm	%T, 1 cm cell	97.1	98.3	30.3		
Iron +Manganese	g/m3	0.51	0.51	15.19	96.6	
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3	2.22	2.24			

Bench T3J2 Manchester St (No sediment) CaO 1.3mL/L of 20% slurry Dose 260g/m3
 Rheomax 1mL/L of 0.1 % soln 1 g/m3

Metalsorb 2mL/L of 0.1% soln 2g/m3

Column T1C1 Manchester St (No sediment) CaO 1.3mL/L of 20% slurry Dose 260 g/m3
 Rheomax 1 mL/L 1 g/m3

Metalsorb 2mL/L 2g/m3

Table 17 Manchester St, sediment, CaO, Metalsorb (Bench T4J2, Column T3C1)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	2	1.26	19.8		
Turbidity Target	NTU	5	5			
pH	pH Units	6.98	7	3.2		
pH Target	pH Units	4.5-7	4.5-7			
Total Alkalinity	g/m3 as CaCO3		12.2	<1		
Total Hardness	g/m3 as CaCO3	-	630			
Total Suspended Solids	g/m3	-	5	<70		
TSS Target	g/m3	5	5			
Dissolved Aluminium	g/m3	0.161	0.13	51	99.7	99.7
Dissolved Aluminium Chronic GV 95%	g/m3		0.37			
Dissolved Aluminium Chronic GV 90%	g/m3		0.46			
Dissolved Aluminium Chronic GV 80%	g/m3		0.63			
Dissolved Cadmium	g/m3		< 0.00005	0.00081		93.8
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037			
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069			
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155			
Dissolved Calcium	g/m3		220			-30.2
Dissolved Chromium	g/m3		< 0.0005	0.0051		90.2
Dissolved Cobalt	g/m3	-0.004 (note in house testing, instrument reading lower than detectable)	0.0095	0.094	104.3	89.9
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033			
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078			
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208			
Dissolved Copper	g/m3		< 0.0005	0.0133		96.2
Dissolved Copper Chronic GV 95%	g/m3		0.0015			
Dissolved Copper Chronic GV 90%	g/m3		0.0018			
Dissolved Copper Chronic GV 80%	g/m3		0.0029			
Dissolved Iron	g/m3	0.002	0.02	13.2	100.0	99.8

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1			
Dissolved Lead	g/m3		< 0.00010	0.00136		92.6
Dissolved Magnesium	g/m3		23	24		4.2
Dissolved Manganese	g/m3	1.2	0.91	1.99	39.7	54.3
Dissolved Manganese Chronic GV 95%	g/m3		1.22			
Dissolved Manganese Chronic GV 90%	g/m3		1.88			
Dissolved Manganese Chronic GV 80%	g/m3		3.07			
Dissolved Nickel	g/m3	0.017	0.04	0.23	92.6	82.6
Dissolved Nickel Chronic GV 95%	g/m3		0.099			
Dissolved Nickel Chronic GV 90%	g/m3		0.118			
Dissolved Nickel Chronic GV 80%	g/m3		0.154			
Dissolved Zinc	g/m3		0.0085	1.11		99.2
Dissolved Zinc Chronic GV 95%	g/m3		0.113			
Dissolved Zinc Chronic GV 90%	g/m3		0.168			
Dissolved Zinc Chronic GV 80%	g/m3		0.289			
Dissolved Organic Carbon (DOC)	g/m3		1.4			
Absorbance at 254 nm	AU cm-1		0.009	0.516		
Transmittance at 254 nm	%T, 1 cm cell	91.7	98.1	30.3		
Iron +Manganese	g/m3	1.202	0.93	15.19	61.2	70.0
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3		1.91			

Bench T4J2: Manchester 3g/L sediment; CaO = 1.3mL/L of 20% slurry/Dose 260g/m3; Metalsorb = 2mL/L of 0.1% soln Dose 2g/m3;
 Rheomax = 1mL/L of 0.1 % soln 1 g/m3
 Column T3C1 Manchester St (3g/L sediment) CaO = 1.3mL/L of 20% slurry. Dose 260 g/m3 Metalsorb = 2mL/L of 0.1% soln Dose 2 g/m3
 Rheomax = 1.5 mL/L of 0.1 % soln Dose 1.5 g/m3

Table 18 – S23, Sediment, CaO, Metalsorb, Rheomax (Bench T11J3/T14S1, Column T5C2)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	60 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	0.99	4.3	0.32		
Turbidity Target	NTU	5	5			
pH	pH Units	6.6	8.1	2.6		
pH Target	pH Units	4.5-7	4.5-7			
Total Alkalinity	g/m3 as CaCO3	7.1	23	<1.0		
Total Hardness	g/m3 as CaCO3	2200	2200			
Total Suspended Solids	g/m3	< 3	16	<8		
TSS Target	g/m3	5	5			
Dissolved Aluminium	g/m3	0.036	1.08	168	100.0	99.4
Dissolved Aluminium Chronic GV 95%	g/m3	0.23	0.49			
Dissolved Aluminium Chronic GV 90%	g/m3	0.29	0.63			
Dissolved Aluminium Chronic GV 80%	g/m3	0.39	0.85			
Dissolved Cadmium	g/m3	0.00013	< 0.00005	0.0026	95.0	98.1
Dissolved Cadmium Chronic GV 95%	g/m3	0.00037	0.00037			
Dissolved Cadmium Chronic GV 90%	g/m3	0.00069	0.00069			
Dissolved Cadmium Chronic GV 80%	g/m3	0.00155	0.00155			
Dissolved Calcium	g/m3	700	720	169		
Dissolved Chromium	g/m3	0.0021	0.0032	0.077	97.3	95.8
Dissolved Cobalt	g/m3	0.052	< 0.0002	0.24	78.3	99.9
Dissolved Cobalt Chronic GV 95%	g/m3	0.0033	0.0033			
Dissolved Cobalt Chronic GV 90%	g/m3	0.0078	0.0078			
Dissolved Cobalt Chronic GV 80%	g/m3	0.0208	0.0208			
Dissolved Copper	g/m3	< 0.0005	< 0.0005	0.055	99.1	99.1
Dissolved Copper Chronic GV 95%	g/m3	0.0010	0.0015			

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	60 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Copper Chronic GV 90%	g/m3	0.0012	0.0018			
Dissolved Copper Chronic GV 80%	g/m3	0.0019	0.0029			
Dissolved Iron	g/m3	<0.02	<0.02	89	100.0	100.0
Dissolved Iron Chronic GV 80%/90%/95%	g/m3	1	1			
Dissolved Lead	g/m3	< 0.00010	< 0.00010	0.00017		
Dissolved Magnesium	g/m3	102	95	93		
Dissolved Manganese	g/m3	3.7	0.4	7.9	53.2	94.9
Dissolved Manganese Chronic GV 95%	g/m3	1.25	1.25			
Dissolved Manganese Chronic GV 90%	g/m3	1.93	1.93			
Dissolved Manganese Chronic GV 80%	g/m3	3.15	3.15			
Dissolved Nickel	g/m3	0.198	< 0.0005	0.68	70.9	99.9
Dissolved Nickel Chronic GV 95%	g/m3	0.099	0.099			
Dissolved Nickel Chronic GV 90%	g/m3	0.118	0.118			
Dissolved Nickel Chronic GV 80%	g/m3	0.154	0.154			
Dissolved Zinc	g/m3	0.037	< 0.0010	3.9	99.1	100.0
Dissolved Zinc Chronic GV 95%	g/m3	0.125	0.046			
Dissolved Zinc Chronic GV 90%	g/m3	0.187	0.069			
Dissolved Zinc Chronic GV 80%	g/m3	0.321	0.118			
Dissolved Organic Carbon (DOC)	g/m3	0.8	1.4			
Absorbance at 254 nm	AU cm-1	0.015	0.015	3.11		
Transmittance at 254 nm	%T, 1 cm cell	96.5	96.7	<0.5		
Iron +Manganese	g/m3	3.72	0.42	96.9	96.2	99.6
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3	2.25	2.25			

Bench T11J3/T14S1: S23 Sediment = 0.3g/L; CaO = 4.5 mL/L of 20% slurry, Dose 900 g/m3;
 Rheomax = 2mL/L of 0.1 % soln Dose 2 g/m3.

Metalsorb = 2.5mL/L of 0.1% soln Dose 2.5 g/m3;

Column T5C2: S23 Sediment = 3g/L; CaO = 4.5 mL/L of 20% slurry, Dose 900 g/m3;
 Rheomax = 3mL/L of 0.1 % soln Dose 3 g/m3.

Metalsorb = 2.5mL/L of 0.1% soln Dose 2.5 g/m3;

Table19 BVE CaO, Sediment, Metalsorb, Rheomax (Bench T15JS2, Column T6C3)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	40 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	1.44	3.7	1.69		
Turbidity Target	NTU	5	5			
pH	pH Units	7.6	7.2	3.4		
pH Target	pH Units	4.5-7	4.5-7			
Total Alkalinity	g/m3 as CaCO3	21	12.7	<1		
Total Hardness	g/m3 as CaCO3	200	196			
Total Suspended Solids	g/m3	3	9	<8		
TSS Target	g/m3	5	5			
Dissolved Aluminium	g/m3	0.49	0.027	10	95.1	99.7
Dissolved Aluminium Chronic GV 95%	g/m3	0.34	0.25			
Dissolved Aluminium Chronic GV 90%	g/m3	0.43	0.31			
Dissolved Aluminium Chronic GV 80%	g/m3	0.59	0.43			
Dissolved Cadmium	g/m3	< 0.00005	0.00007	0.00034	85.3	79.4
Dissolved Cadmium Chronic GV 95%	g/m3	0.00028	0.00028			
Dissolved Cadmium Chronic GV 90%	g/m3	0.00052	0.00051			
Dissolved Cadmium Chronic GV 80%	g/m3	0.00117	0.00115			
Dissolved Calcium	g/m3	76	73	31		
Dissolved Chromium	g/m3	< 0.0005	< 0.0005	0.001	50.0	50.0
Dissolved Cobalt	g/m3	0.0057	0.028	0.048	88.1	41.7
Dissolved Cobalt Chronic GV 95%	g/m3	0.0025	0.0025			
Dissolved Cobalt Chronic GV 90%	g/m3	0.0059	0.0058			
Dissolved Cobalt Chronic GV 80%	g/m3	0.0157	0.0155			
Dissolved Copper	g/m3	< 0.0005	< 0.0005	0.0161	96.9	96.9
Dissolved Copper Chronic GV 95%	g/m3	0.0013	0.0011			
Dissolved Copper Chronic GV 90%	g/m3	0.0015	0.0013			

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	40 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Copper Chronic GV 80%	g/m3	0.0024	0.0021			
Dissolved Iron	g/m3	0.02	0.02	7.1	99.7	99.7
Dissolved Iron Chronic GV 80%/90%/95%	g/m3	1	1			
Dissolved Lead	g/m3	< 0.00010	< 0.00010	0.0057	98.2	98.2
Dissolved Magnesium	g/m3	3.4	3.5	3.2	-6.2	-9.4
Dissolved Manganese	g/m3	0.24	0.37	0.47	48.9	21.3
Dissolved Manganese Chronic GV 95%	g/m3	0.76	0.76			
Dissolved Manganese Chronic GV 90%	g/m3	1.17	1.16			
Dissolved Manganese Chronic GV 80%	g/m3	1.92	1.90			
Dissolved Nickel	g/m3	0.022	0.069	0.096	77.1	28.1
Dissolved Nickel Chronic GV 95%	g/m3	0.055	0.054			
Dissolved Nickel Chronic GV 90%	g/m3	0.065	0.064			
Dissolved Nickel Chronic GV 80%	g/m3	0.085	0.084			
Dissolved Zinc	g/m3	0.0015	0.069	0.6	99.8	88.5
Dissolved Zinc Chronic GV 95%	g/m3	0.033	0.041			
Dissolved Zinc Chronic GV 90%	g/m3	0.049	0.061			
Dissolved Zinc Chronic GV 80%	g/m3	0.084	0.105			
Dissolved Organic Carbon (DOC)	g/m3	1.1	0.9			
Absorbance at 254 nm	AU cm-1	0.011	0.01	0.191		
Transmittance at 254 nm	%T, 1 cm cell	97.6	97.7	64.4		
Iron +Manganese	g/m3	0.26	0.39	7.57	96.6	94.8
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3	1.76	1.76			

Bench T15J52 BVE (3g/L Sediment) 0.4mL/L of 20% slurry. Dose 80 g/m3 CaO 1mL/L of 0.1% soln Dose 1 g/m3 Metalsorb 1mL/L of 0.1 % soln 1 g/m3 Rheomax
 Column T6C3 BVE (3g/L Sediment) 0.35mL/L of 20% slurry. Dose 70 g/m3 CaO 1mL/L of 0.1% soln Dose 1 g/m3 Metalsorb 1mL/L of 0.1 % soln 1 g/m3 Rheomax

Table 20 Manchester, Sediment, with MgO/Metalsorb/Rheomax (Bench T6J1, Column T2C3)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	1.77	N/A	19.8		N/A
Turbidity Target	NTU	5				
pH	pH Units	7.2	N/A	3.2		N/A
pH Target	pH Units	4.5-7				
Total Alkalinity	g/m3 as CaCO3	11.1	N/A	<1		N/A
Total Hardness	g/m3 as CaCO3	640				
Total Suspended Solids	g/m3	< 3	N/A	<70	95.7	N/A
TSS Target	g/m3	5				
Dissolved Aluminium	g/m3	0.119	N/A	51	99.8	N/A
Dissolved Aluminium Chronic GV 95%	g/m3	0.42				
Dissolved Aluminium Chronic GV 90%	g/m3	0.53				
Dissolved Aluminium Chronic GV 80%	g/m3	0.73				
Dissolved Cadmium	g/m3	< 0.00005	N/A	0.00081	93.8	N/A
Dissolved Cadmium Chronic GV 95%	g/m3	0.00037				
Dissolved Cadmium Chronic GV 90%	g/m3	0.00069				
Dissolved Cadmium Chronic GV 80%	g/m3	0.00155				
Dissolved Calcium	g/m3	70	N/A		58.6	N/A
Dissolved Chromium	g/m3	< 0.0005	N/A	0.0051	90.2	N/A
Dissolved Cobalt	g/m3	0.0138	N/A	0.094	85.3	N/A
Dissolved Cobalt Chronic GV 95%	g/m3	0.0033				
Dissolved Cobalt Chronic GV 90%	g/m3	0.0078				
Dissolved Cobalt Chronic GV 80%	g/m3	0.0208				
Dissolved Copper	g/m3	< 0.0005	N/A	0.0133	96.2	N/A
Dissolved Copper Chronic GV 95%	g/m3	0.0016				

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Copper Chronic GV 90%	g/m3	0.0020				
Dissolved Copper Chronic GV 80%	g/m3	0.0032				
Dissolved Iron	g/m3	<0.02	N/A	13.2	99.8	N/A
Dissolved Iron Chronic GV 80%/90%/95%	g/m3	1				
Dissolved Lead	g/m3	< 0.00010	N/A	0.00136	92.6	N/A
Dissolved Magnesium	g/m3	112	N/A	24	-366.7	N/A
Dissolved Manganese	g/m3	1.15	N/A	1.99	42.2	N/A
Dissolved Manganese Chronic GV 95%	g/m3	1.23				
Dissolved Manganese Chronic GV 90%	g/m3	1.89				
Dissolved Manganese Chronic GV 80%	g/m3	3.09				
Dissolved Nickel	g/m3	0.077	N/A	0.23	66.5	N/A
Dissolved Nickel Chronic GV 95%	g/m3	0.099				
Dissolved Nickel Chronic GV 90%	g/m3	0.118				
Dissolved Nickel Chronic GV 80%	g/m3	0.154				
Dissolved Zinc	g/m3	0.0046	N/A	1.11	99.6	N/A
Dissolved Zinc Chronic GV 95%	g/m3	0.101				
Dissolved Zinc Chronic GV 90%	g/m3	0.151				
Dissolved Zinc Chronic GV 80%	g/m3	0.259				
Dissolved Organic Carbon (DOC)	g/m3	1.6	N/A		0.0	N/A
Absorbance at 254 nm	AU cm-1	0.011	N/A	0.516	97.9	N/A
Transmittance at 254 nm	%T, 1 cm cell	97.4	N/A	30.3	-221.5	N/A
Iron +Manganese	g/m3	1.17	N/A	15.19	62.3	N/A
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3	2.23				

Bench T6J1 Manchester St (0.3g/l sediment) 4.5mL/L of 20% slurry. Dose 900 g/m3 MgO 2mL/L of 0.1% soln Dose 2 g/m3 Metalsorb 1mL/L of 0.1 % soln Dose 1 g/m3 Rheomax
 Column T2C3 Manchester St (3g/L sediment) 4.5mL/L of 20% slurry. Dose 900 g/m3 MgO 2mL/L of 0.1% soln Dose 2 g/m3 Metalsorb 1mL/L of 0.1 % soln Dose 1 g/m3 Rheomax

Table 21 Manchester, Sediment, with CaO, Superfloc BX5, Crystalfloc 610H (Bench T17J1, Column T7C3)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	N/A	0.95	19.8		
Turbidity Target	NTU		5			
pH	pH Units	N/A	6.9	3.2		
pH Target	pH Units		4.5-7			
Total Alkalinity	g/m3 as CaCO3	N/A	7.9	<1		
Total Hardness	g/m3 as CaCO3		620			
Total Suspended Solids	g/m3	N/A	6	<70		
TSS Target	g/m3		5			
Dissolved Aluminium	g/m3	N/A	0.024	51		100.0
Dissolved Aluminium Chronic GV 95%	g/m3		0.32			
Dissolved Aluminium Chronic GV 90%	g/m3		0.41			
Dissolved Aluminium Chronic GV 80%	g/m3		0.56			
Dissolved Cadmium	g/m3	N/A	0.00023	0.00081		71.6
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037			
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069			
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155			
Dissolved Calcium	g/m3	N/A	210			-24.3
Dissolved Chromium	g/m3	N/A	< 0.0005	0.0051		90.2
Dissolved Cobalt	g/m3	N/A	0.038	0.094		59.6
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033			
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078			
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208			
Dissolved Copper	g/m3	N/A	< 0.0005	0.0133		96.2
Dissolved Copper Chronic GV 95%	g/m3		0.0013			
Dissolved Copper Chronic GV 90%	g/m3		0.0016			
Dissolved Copper Chronic GV 80%	g/m3		0.0026			
Dissolved Iron	g/m3	N/A	<0.02	13.2		99.8

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1			
Dissolved Lead	g/m3	N/A	< 0.00010	0.00136		92.6
Dissolved Magnesium	g/m3	N/A	24	24		
Dissolved Manganese	g/m3	N/A	1.29	1.99		35.2
Dissolved Manganese Chronic GV 95%	g/m3		1.22			
Dissolved Manganese Chronic GV 90%	g/m3		1.87			
Dissolved Manganese Chronic GV 80%	g/m3		3.05			
Dissolved Nickel	g/m3	N/A	0.116	0.23		49.6
Dissolved Nickel Chronic GV 95%	g/m3		0.099			
Dissolved Nickel Chronic GV 90%	g/m3		0.118			
Dissolved Nickel Chronic GV 80%	g/m3		0.154			
Dissolved Zinc	g/m3	N/A	0.052	1.11		95.3
Dissolved Zinc Chronic GV 95%	g/m3		0.115			
Dissolved Zinc Chronic GV 90%	g/m3		0.172			
Dissolved Zinc Chronic GV 80%	g/m3		0.295			
Dissolved Organic Carbon (DOC)	g/m3	N/A	1.2			
Absorbance at 254 nm	AU cm-1	N/A	0.012	0.516		
Transmittance at 254 nm	%T, 1 cm cell	N/A	97.4	30.3		
Iron +Manganese	g/m3	N/A	1.31	15.19		57.7
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3		2.22			

Bench T17J1 Manchester St (3g/L sediment) 1.3mL/L of 20% slurry. Dose 260 g/m3 CaO 1mL/L of 1% soln Dose 10 g/m3 Superfloc BX5 1 mL/L of 0.1% soln. Dose 1 g/m3 Crystalfloc 610H
 Column T7C3 Manchester St (3g/L sediment) 1.3mL/L of 20% slurry. Dose 260 g/m3 CaO 1mL/L of 1% soln Dose 10 g/m3 Superfloc BX5 1 mL/L of 0.1% soln. Dose 1 g/m3 Crystalfloc 610H

Table 22 - S23, Sediment, with CaO, Superfloc BX5, Crystalfloc 610H (Bench T19J3, Column T8C2)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	N/A	3	0.32	N/A	
Turbidity Target	NTU	5	5			
pH	pH Units	N/A	7.3	2.6	N/A	
pH Target	pH Units	4.5-7	4.5-7			
Total Alkalinity	g/m3 as CaCO3	N/A	11.8	<1.0	N/A	
Total Hardness	g/m3 as CaCO3		2100			
Total Suspended Solids	g/m3	N/A	12	<8	N/A	
TSS Target	g/m3	5	5			
Dissolved Aluminium	g/m3	N/A	0.27	168	N/A	99.8
Dissolved Aluminium Chronic GV 95%	g/m3		0.40			
Dissolved Aluminium Chronic GV 90%	g/m3		0.50			
Dissolved Aluminium Chronic GV 80%	g/m3		0.69			
Dissolved Cadmium	g/m3	N/A	0.00006	0.0026	N/A	97.7
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037			
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069			
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155			
Dissolved Calcium	g/m3	N/A	700	169	N/A	-314.2
Dissolved Chromium	g/m3	N/A	0.003	0.077	N/A	96.1
Dissolved Cobalt	g/m3	N/A	0.0021	0.24	N/A	99.1
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033			
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078			
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208			
Dissolved Copper	g/m3	N/A	< 0.0005	0.055	N/A	99.1
Dissolved Copper Chronic GV 95%	g/m3		0.0015			
Dissolved Copper Chronic GV 90%	g/m3		0.0018			
Dissolved Copper Chronic GV 80%	g/m3		0.0029			
Dissolved Iron	g/m3	N/A	<0.02	89	N/A	100.0
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1.0			
Dissolved Lead	g/m3	N/A	< 0.00010	0.00017	N/A	41.2

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Magnesium	g/m3	N/A	93	93	N/A	
Dissolved Manganese	g/m3	N/A	1.22	7.9	N/A	84.6
Dissolved Manganese Chronic GV 95%	g/m3		1.25			
Dissolved Manganese Chronic GV 90%	g/m3		1.93			
Dissolved Manganese Chronic GV 80%	g/m3		3.15			
Dissolved Nickel	g/m3	N/A	0.0007	0.68	N/A	99.9
Dissolved Nickel Chronic GV 95%	g/m3		0.099			
Dissolved Nickel Chronic GV 90%	g/m3		0.118			
Dissolved Nickel Chronic GV 80%	g/m3		0.154			
Dissolved Zinc	g/m3	N/A	0.0018	3.9	N/A	100.0
Dissolved Zinc Chronic GV 95%	g/m3		0.088			
Dissolved Zinc Chronic GV 90%	g/m3		0.132			
Dissolved Zinc Chronic GV 80%	g/m3		0.226			
Dissolved Organic Carbon (DOC)	g/m3	N/A	1.4		N/A	
Absorbance at 254 nm	AU cm-1	N/A	0.013	3.11	N/A	
Transmittance at 254 nm	%T, 1 cm cell	N/A	97	<0.5	N/A	
Iron +Manganese	g/m3	N/A	1.24	96.9	N/A	98.7
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3		2.25			

Bench T19J3 S23 (3g/L sediment) 4.5mL/L of 20% slurry. Dose 900 g/m3 CaO 3mL/L of 1% soln Dose 30 g/m3 Superfloc BX5 2 mL/L of 0.1% soln. Dose 2 g/m3 Crystalfloc 610H
 Column T8C2 S23 (3g/L sediment) 4.5mL/L of 20% slurry. Dose 900 g/m3 CaO 3mL/L of 1% soln Dose 30 g/m3 Superfloc BX5 2 mL/L of 0.1% soln. Dose 2 g/m3 Crystalfloc 610H

Table 23 - BVE, CaO, Sediment, Superfloc BX5, Crystalfloc 610H (Bench T19J1, Column T9C1)

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Turbidity	NTU	N/A	0.84	1.69	N/A	
Turbidity Target	NTU		5			
pH	pH Units	N/A	7.7	3.4	N/A	
pH Target	pH Units		4.5-7			
Total Alkalinity	g/m3 as CaCO3	N/A	17.4	<1	N/A	
Total Hardness	g/m3 as CaCO3		210			
Total Suspended Solids	g/m3	N/A	6	<8	N/A	
TSS Target	g/m3		5			
Dissolved Aluminium	g/m3	N/A	0.58	10	N/A	94.2
Dissolved Aluminium Chronic GV 95%	g/m3		0.38			
Dissolved Aluminium Chronic GV 90%	g/m3		0.48			
Dissolved Aluminium Chronic GV 80%	g/m3		0.66			
Dissolved Cadmium	g/m3	N/A	< 0.00005	0.00034	N/A	85.3
Dissolved Cadmium Chronic GV 95%	g/m3		0.00029			
Dissolved Cadmium Chronic GV 90%	g/m3		0.00054			
Dissolved Cadmium Chronic GV 80%	g/m3		0.00122			
Dissolved Calcium	g/m3	N/A	76	31	N/A	-145.2
Dissolved Chromium	g/m3	N/A	< 0.0005	0.001	N/A	50.0
Dissolved Cobalt	g/m3	N/A	0.0051	0.048	N/A	89.4
Dissolved Cobalt Chronic GV 95%	g/m3		0.0025			
Dissolved Cobalt Chronic GV 90%	g/m3		0.0060			
Dissolved Cobalt Chronic GV 80%	g/m3		0.0160			
Dissolved Copper	g/m3	N/A	0.0005	0.0161	N/A	96.9
Dissolved Copper Chronic GV 95%	g/m3		0.0013			
Dissolved Copper Chronic GV 90%	g/m3		0.0016			
Dissolved Copper Chronic GV 80%	g/m3		0.0026			
Dissolved Iron	g/m3	N/A	< 0.02	7.1	N/A	99.7
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1.0			

PARAMETER	UNIT	BENCH SCALE TREATED SUPERNATANT RESULTS	30 MIN COLUMN SCALE TREATED SUPERNATANT RESULTS	RAW WATER QUALITY	BENCH METALS REDUCTION %	COLUMN METALS REDUCTION %
Dissolved Lead	g/m3	N/A	< 0.00010	0.0057	N/A	98.2
Dissolved Magnesium	g/m3	N/A	3.4	3.2	N/A	-6.2
Dissolved Manganese	g/m3	N/A	0.19	0.47	N/A	59.6
Dissolved Manganese Chronic GV 95%	g/m3		0.78			
Dissolved Manganese Chronic GV 90%	g/m3		1.20			
Dissolved Manganese Chronic GV 80%	g/m3		1.95			
Dissolved Nickel	g/m3	N/A	0.02	0.096	N/A	79.2
Dissolved Nickel Chronic GV 95%	g/m3		0.058			
Dissolved Nickel Chronic GV 90%	g/m3		0.068			
Dissolved Nickel Chronic GV 80%	g/m3		0.089			
Dissolved Zinc	g/m3	N/A	0.0016	0.6	N/A	99.7
Dissolved Zinc Chronic GV 95%	g/m3		0.033			
Dissolved Zinc Chronic GV 90%	g/m3		0.049			
Dissolved Zinc Chronic GV 80%	g/m3		0.084			
Dissolved Organic Carbon (DOC)	g/m3	N/A	1.2		N/A	
Absorbance at 254 nm	AU cm-1	N/A	0.01	0.191	N/A	
Transmittance at 254 nm	%T, 1 cm cell	N/A	97.7	64.4	N/A	
Iron +Manganese	g/m3	N/A	0.21	7.57	N/A	97.2
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3		1.78			

Bench T19J1 BVE (3g/L sediment) 0.35mL/L of 20% slurry. Dose 70 g/m3 CaO 0.5mL/L of 1% soln Dose 5 g/m3 Superfloc BX5 1 mL/L of 0.1% soln. Dose 1 g/m3 Crystalfloc 610H
 Column T9C1 BVE (3g/L sediment) 0.35mL/L of 20% slurry. Dose 70 g/m3 CaO 0.5mL/L of 1% soln Dose 5 g/m3 Superfloc BX5 1 mL/L of 0.1% soln. Dose 1 g/m3 Crystalfloc 610H

5.5 Post settling supernatant pH adjustment

Based on the results of the jar and column testing, some final pH adjustment may be necessary. The Treatment pH Target used as the basis for this investigation indicate a final process pH between 5.5-6.5 is required. The final pH of the supernatant in the column and jar tests carried out in this investigation were in the order of pH 5-8. In drinking water treatment, citric acid is often used for pH adjustment.

Citric Acid is a weak organic acid and is just one of several pH adjustment methods. Another common pH adjustment method is CO₂ gas. The various methods can have different effects on the final water quality and further optimisation is necessary to determine an appropriate pH correction method and its effect on the supernatant.

The citric testing presented here simulates post polishing adjustment. The point in the process at which pH is adjusted should also be given further consideration as prior to final polishing may be preferable to post polishing.

To gauge the amount of citric acid that may be required to adjust the pH of the supernatant from the WTP discharge, testing was carried out on three supernatant samples taken from the experimental settling columns.

Method:

1. Samples were taken from Column tests 7, 8 & 9 (see table 24) after approximately 24hrs settling, (simulating discharge from a polishing pond)
2. A 1% Citric Acid solution was prepared (1g citric acid powder dissolved in 100mL of Deionised water)
3. Citric acid solution was added drop-wise using a 1mL tuberculin syringe to a 200mL sample of supernatant
4. After each drop was mixed in and pH stabilised, the pH was recorded
5. Total number of drops added as well as total volume of citric acid solution was recorded

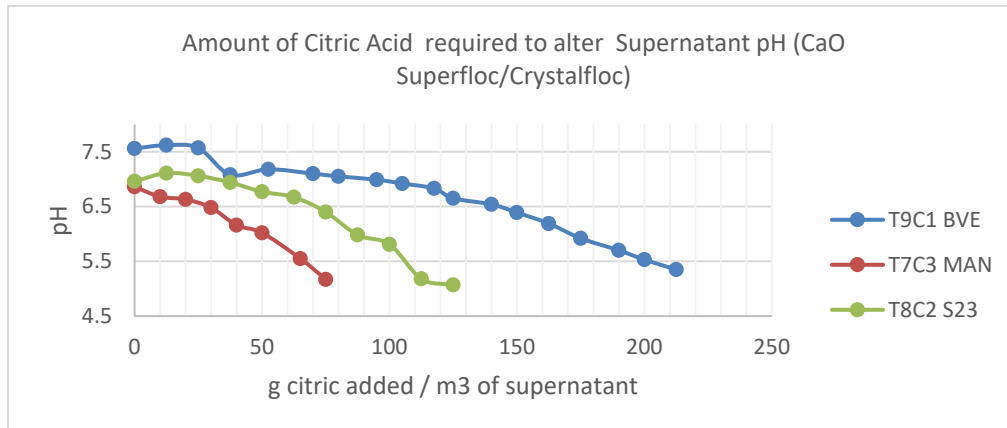
Results:

Manchester/CaO/Crystalfloc/Superfloc. To lower pH from 6.86 to 6.5 required 30g citric per m³ of supernatant.

S23/CaO/Crystalfloc/Superfloc. To lower pH from 6.96 to 6.5 required 75g citric per m³ of supernatant.

Barron Valley ELF/CaO/Crystalfloc/Superfloc. To lower pH from 7.56 to 6.5 required 145g citric per m³ of supernatant.

Table 24 pH Change with Citric Addition



APPENDIX A – RAW WATER QUALITY TEST RESULTS

Sample Type: Potable Water				
Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

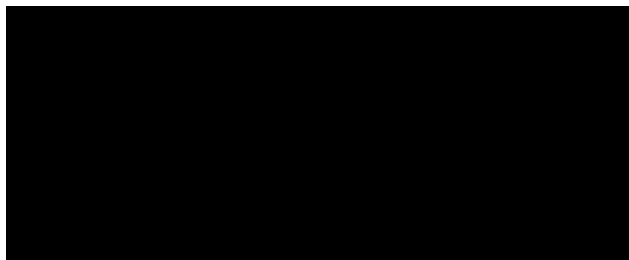
Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

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APPENDIX B – MODIFIED GUIDELINE VALUES

Table 1. Guideline value modification algorithms

Table updated 020725 (V3, revised 121125. See version notes below for changes*)

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
Dissolved Aluminium Guideline Values (µg/L)			
	Chronic Al GV		
95% LoP. pH ≤ 6.5	500	pH: ≤ 6.5 (Note 4)	See “Note 4” for basis of change of pH threshold. This reduces set change at this pH transition. Eqn at pH 6.5, H=10, DOC=5 → 160 ug/L
95% LoP. pH > 6.5	exp(0.645×ln(DOC) + 2.255×ln(Hardness) + 1.995×pH + (-0.284×ln(Hardness)×pH) -9.898) *Note if algorithm is ≤ pH 6.5 use 500.	pH: 6.5 – 8.7 Hardness: 10 – 430 mg/L DOC: 0.08 – 12.3 mg/L	
90% LoP	95% LoP / 0.79		The adjustment factor is calculated from the Canadian chronic SSD.
80% LoP	95% LoP / 0.58		As above
Dissolved Copper Guideline Values (µg/L)			
	Chronic Cu GV		
95% LoP	DGV _{0.5} × (DOC/0.5)^0.70 where DGV _{0.5} = 0.73	pH: 6 – 8.5 Hardness: 2 – 400 mg/L DOC: 0.1 – 20 mg/L	
90% LoP	DGV _{0.5} × (DOC/0.5)^ 0.70 where DGV _{0.5} = 0.89		
80% LoP	DGV _{0.5} × (DOC/0.5)^ 0.70 where DGV _{0.5} = 1.4		
	Acute Cu GV		
95% LoP	exp (-6.6 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	pH: 5 – 8.8 Hardness: 3.9 – 898 mg/L DOC: 0.1 – 30 mg/L	
90% LoP	exp (-6.3 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
80% LoP	exp (-5.8 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
Dissolved Iron Guideline Values (µg/L)			
All LoP	1000	All conditions	
Dissolved Zinc Guideline values (µg/L)			
	Chronic Zn GV		
95% LoP	exp(0.947xln(Hardness) - 0.815xpH + 0.398xln(DOC) + 4.63)	pH: 5.7 – 8.1 Hardness: 15 – 399 mg/L DOC: 0.3 – 22.9 mg/L	
90% LoP	95% LoP / 0.67		
80% LoP	95% LoP / 0.39		
	Acute Zn GV		
95% LoP	exp (2.5 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	pH: 5.4 – 8.5 Hardness: 14 – 826 mg/L DOC: 0.1 – 22 mg/L	
90% LoP	exp (2.9 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
80% LoP	exp (3.4 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
Dissolved Cobalt Guideline values (µg/L)			
	Chronic Co GV		
95% LoP	Exp((0.414xLn(hardness))-1.285)	Hardness range: 52-396 mg/L	CCME (2017). Equations for 90% and 80% protection calculated from CCME chronic data. Note: This has hardness modifier which was not in the ANZECC (2000) guidelines.
90% LoP	Exp((0.414xLn(hardness))-0.427)		
80% LoP	Exp((0.414xLn(hardness))+0.557)		
	Acute Co GV		
95% LoP	95%Chronic CoGV/0.16	Hardness range: 52-396 mg/L	Acute peak estimated based on zinc no effect acute and chronic ratio for index water quality conditions.
90% LoP	95%Chronic CoGV/0.11		
80% LoP	95%Chronic CoGV/0.062		
Dissolved Nickel Guideline values (µg/L)			
	Chronic Ni GV		

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
95% LoP	$11 \times (\text{Hardness}/30)^{0.85}$	Hardness range: 30-400 mg/L. No guidance for pH application range. Normally taken as physiological pH range as used for testing (pH 6.5-8.5)	ANZG (2018) guideline.
90% LoP	$13 \times (\text{Hardness}/30)^{0.85}$		
80% LoP	$17 \times (\text{Hardness}/30)^{0.85}$		
	Acute Ni GV		
95% LoP	95%Chronic NiGV/0.16	Hardness range: 30-400 mg/L	Acute peak estimated based on zinc no effect acute and chronic ratio for index water quality conditions.
90% LoP	95%Chronic NiGV/0.11		
80% LoP	95%Chronic NiGV/0.062		
	Dissolved Manganese Guideline values (µg/L)		
	Chronic Mn GV		
95% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.46))$	Hardness range: 25-670 mg/L Simplified equation for hardness only calculated at pH 7.5. Look-up tables provided for pH 5.8 to 8.4.	CCME (2019). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Note: This has hardness modifier which was not in the ANZECC (2000) guidelines.
90% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.89))$		
80% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 5.38))$		
	Acute Mn GV		
95% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 4.84)))/2.13$	Hardness range: 25-250 mg/L	CCME (2019). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024).
90% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 6.90)))/2.13$		
80% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 7.20)))/2.13$		
	Dissolved Cadmium Guideline values (GVs, µg/L)		
	Chronic Cd GV		CCME (2014)
95% LoP	$10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}$	Hardness range: 17-280 mg/L	CCME (2014). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection.
90% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 1.84$		
80% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 4.15$		
	Acute Cd GV		
95% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/2.13$	Hardness range: 5.3-360 mg/L	CCME (2014) acute dataset. Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024).
90% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/2.77$		
80% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/9.58$		
	Nitrate-N (ANZG – hardness (H)-dependent; guideline)		
	Chronic Nitrate-N GV		
95% LoP	1100 (H<30); 2600 (H30-150); 29,000 (H >150)	Hardness dependent	ANZG (2025a)
90% LoP	1500 (H<30); 4200 (H30-150); 38,000 (H >150)		
80% LoP	2300 (H<30); 7100 (H30-150); 56,000 (H >150)		
	Acute Nitrate-NGV		
	Not available		

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
	Nitrate-N (NPS-FM; standard)		
	Chronic Nitrate-N Standard (median standard)		MfE (2020)
95% LoP	2400		
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Acute Nitrate-N Standard (95th percentile standard)		
95% LoP	3500		
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Chronic ammoniacal-N (ANZG guideline)		
95% LoP	900	pH dependent. Values at pH 8.	
90% LoP	1430		
80% LoP	2300		
	Acute ammoniacal-N (ANZG guideline)		
	Not available		
	Chronic ammoniacal-N (NPS-FM median standard)		
95% LoP	240	pH dependent. Values at pH 8.	
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Acute ammoniacal-N (NPS-FM95th percentile standard)		
95% LoP	400	pH dependent. Values at pH 8.	
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	pH		
	Maintain in range 4.5 – 7.0 for WTP discharge		pH: Upper pH to be confirmed from bryophyte analysis for sites with differing levels of protection.

Note 1: The level of protection (LoP) values are species protection levels based on narrative descriptors from ANZG (2018).

Note 2: The compliance range for pH at Smokestack is 4.5 to 7.0. The equations vary in their calibrated TMF ranges. For monitored water quality values less than the lowest calibrated TMF value the calculated guideline value (GV) will apply to that monitoring occasion.

Note 3: Toxicity modifying factors (TMFs) are pH, hardness (calcium and magnesium concentrations) and dissolved organic carbon (DOC, measured as dissolved purgeable organic carbon (DPOC) in natural waters). For pH, hardness and DOC values exceeding the TMF range use the lowest or highest calculated LoP value (except for dissolved aluminum where a 500 µg/L LoP applies to waters below pH 6.5 for all hardness and DOC concentrations).

Note 4: pH minimum for aluminum is based on the pH transition for Al³⁺ and Al-DOM (dissolved organic matter) binding which have elevated concentrations at lower pH levels. This pH threshold also corresponds to that used in the ANZG (2018) and ANZECC (2000) guidelines for Australia and New Zealand.

***1. Revision (040725):**

1. Correct nickel equation to calculate as µg/L. Input issue with base ANZG GVs used.
2. Corrected all manganese equations with formula error transcribing from Excel.
3. Changed iron to be µg/L to be consistent with all other GVs.

***2. V3 Revision (121125) notes:**

#	Parameter	Change and comments	Reference
1	Cadmium	New parameter. Adjusted protection levels calculated from SSD through chronic and acute data. Often less than the trace analytical detection limit (Level of Quantitation = LOQ) for sites. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	CCME (2014)
2	Copper	Slope change to 0.70. DOC maxima to 20 mg/L. Very little change to base sensitivities at 0.5 mg/L DOC.	ANZG (2025b)
3	Nitrate_ANZG	New toxicity chronic guideline thresholds added	ANZG (2025a)
4	Nitrate_NPS-FM	Chronic (median) and acute (95 th percentile) standards added.	MfE (2020)
5	Ammonia_ANZG	Chronic guideline thresholds added. Note standardized to pH 8.	ANZG (2018e)
6	Ammonia_NPS-FM	Chronic (median) and acute (95 th percentile) standards added. Note standardized to pH 8. pH adjustment table in Appendix.	MfE (2020); MfE (2018)
7	Cobalt	No change. Suggest using the CCME (2019) as interim pending Stubblefield updating and revision of TMFs. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	
8	Nickel	No change. Suggest using the ANZECC (2000) (as currently in ANZG 2018) as interim pending ANZG updating and revision of guideline. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	ANZG (2018) retains ANZECC (2000)
9	Iron	Retaining 1000 ug/L for iron for all conditions. This is the threshold for iron floc formation in oxygenated circum-neutral pH waters from US EPA (1986) guidance. A very recent iron toxicity guideline has just been released from ANZG (2025f). A fish (fathead minnow) is the most sensitive in this dataset. Fish not present on the plateaux. Recommend that the suitability of the iron guideline be evaluated against future ecological monitoring. The site-specific water chemistry and hydrological regime is the basis for this recommended approach.	US EPA (1986)
10	pH	The recommended pH range for the WTP discharge is 4.5 to 7.0 based on bryophyte communities (pending completion of final report). Information on pH variability from by-pass events from sumps yet to be finalized and reviewed.	
11	Compliance guidance	Add-to-background approach recommended for Waimangaroa compliance sites (Smokestack and downstream) based on the historic mine AMD inputs. This would apply to trace concentration metals: Zn, Cd, Co, Ni. The AMD inputs are highly variable with flow for pH, hardness, DOC, Al, Zn and other trace metal concentrations. This variability in metal concentrations and TMFs are primary justification for the need to adequately account for the upstream concentration variation. Secondarily, macroinvertebrate monitoring and chemistry indicates these are “Highly disturbed system” sites warranting a 90% LoP. There are no fish present at these sites. Toxicity testing of koura indicates a high tolerance of these metals. Mayfly (Deleatidium) testing shows a high tolerance of Co and Ni at both pH 5.5 and pH 7 acute and chronic exposure periods. Other ESE and MFS sites would use the 95% LoP as the GV for assessments downstream of WTP and by-pass discharges.	

		The consent conditions need to incorporate a removal of Cd, Co, Ni if they are at the trace LOQ for multiple monitoring occasions.	
12	Alumnion testing	Alumnion test proposed to better resolve the bioavailable aluminium fraction for longitudinal stream surveys and for sump monitoring. This testing should also be applied to receiving water dilutions with by-pass sump waters if they are low pH and have high Al concentrations. Conditions to be added to consent conditions.	
13	Equation spreadsheet	Calculates GV's for metals for different TMF conditions. Nitrate-N and ammoniacal-N not in spreadsheet.	

References

ANZG 2025b Toxicant default guideline values for aquatic ecosystem protection: Dissolved copper in freshwater, p. 56, Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2025a Toxicant default guideline values for aquatic ecosystem protection: Nitrate in freshwater, p. 35, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2025f Toxicant default guideline values for aquatic ecosystem protection: Iron in freshwater, p. 36, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand governments and Australian state and territory governments.

ANZG 2018e Ammonia in freshwater and marine water (<https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/toxicants/ammonia-2000>), Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

CCME 2014 Canadian water quality guidelines for the protection of aquatic life: Cadmium. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, p. 11, Canadian Council of Ministers of the Environment, Winnipeg, Canada.

MfE 2020c National Policy Statement for Freshwater Management 2020 - October 2024, p. 75, Ministry for the Environment, Wellington.

MfE 2018 A Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management (as amended 2017), p. 47, Ministry for the Environment, Wellington.

US EPA 1986 Quality criteria for water (Gold book) 1986, p. 395, United States Environmental Protection Agency, Office of Water, Regulation and Standards Division, Washington D.C.

Appendix

MfE (2018) A Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management (as amended 2017). p. 47. Ministry for the Environment, Wellington.

Appendix – Ammonia adjustment calculations

ANZECC (2000, Section 8.3.7.2) observes that total ammoniacal nitrogen, $\text{NH}_4\text{-N}$ (often referred to as 'total ammonia'), 'refers to two chemical species that are in equilibrium in water: the un-ionised ammonia, NH_3 , and the ionised ammonium ion, NH_4^+ .' And, 'The proportion of the two chemical forms varies with the physico-chemical properties of the water, particularly pH and temperature.'

However, as the name 'total ammonia' implies, the combined amount of these two chemical species is constant, and it does not vary with the physico-chemical properties of the water. That is, 'adjusting' the ammonia concentration for pH does not mean that the amount of total ammonia present changes (and in fact the standard laboratory analysis for $\text{NH}_4\text{-N}$ is successfully carried out at a high pH, e.g. pH 11).

Instead, pH adjustment means calculating the amount of $\text{NH}_4\text{-N}$ at pH 8 that would have the equivalent toxicity to the amount of $\text{NH}_4\text{-N}$ measured in the sample at the pH of the sample – whatever that may have been. That is, the calculation produces the concentration of $\text{NH}_4\text{-N}$ which at pH 8 would have the same toxicity as the observed (ie, unadjusted) $\text{NH}_4\text{-N}$ concentration would have at the observed pH.

The information in table 10 allows the ammonia concentration of a sample to be converted to an equivalent concentration at pH 8 using the following equation:

$$\text{Conc}_{\text{pH } 8} = \frac{\text{Conc}_{\text{pH sample}}}{\text{Ratio}} \quad \text{Equation (1)}$$

Where $\text{Conc}_{\text{pH sample}}$ is the concentration of the sample and Ratio is read from table 10 for the given sample pH.

For example, if a sample was observed with 1.12 mg $\text{NH}_4\text{-N/L}$ at pH 7.5, the adjusted concentration to use in calculating sample statistics would be 0.63 mg $\text{NH}_4\text{-N/L}$ at pH 8. This is derived as follows:

Using equation (1) and table 10:

$$\text{Conc}_{\text{pH } 8} = 0.63 = \frac{1.12}{1.79}$$

Where the numerator (1.12) is the observed sample concentration and the denominator (1.79) is the Ratio from table 10 at pH of 7.5.

That is, although there is still 1.12 mg/L of $\text{NH}_4\text{-N}$ present in the sample, the adjustment process has identified that the toxicity of this sample at pH 7.5 is equivalent to the toxicity associated with a $\text{NH}_4\text{-N}$ concentration of 0.63 mg/L at pH 8. It's the equivalent toxicity that has been adjusted, and not the amount of $\text{NH}_4\text{-N}$ present in the sample (which remains unchanged).

Note that a method for converting to standard temperature is not currently available.

Table 10: Conversion ratios for pH adjustment of ammonia concentrations

Sample pH	Ratio	Sample pH	Ratio	Sample pH	Ratio
6	2.86	7	2.42	8.1	0.87
6.1	2.84	7.1	2.32	8.2	0.73
6.2	2.82	7.2	2.21	8.3	0.62
6.3	2.80	7.3	2.09	8.4	0.53
6.4	2.77	7.4	1.94	8.5	0.44
6.5	2.73	7.5	1.79	8.6	0.38
6.6	2.70	7.6	1.63	8.7	0.32
6.7	2.64	7.7	1.47	8.8	0.27
6.8	2.59	7.8	1.31	8.9	0.23
6.9	2.51	7.9	1.14	9	0.20
		8	1.00	>9	0.20

Source: Adapted from ANZECC (2000) and Hickey (2014).

Table 1. Guideline value modification algorithms

Table updated 020725 (v4, revised 190326. See version notes below for changes*)

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
Dissolved Aluminium Guideline Values (µg/L)			
	Chronic Al GV		
95% LoP. pH ≤ 6.5	500	pH: ≤ 6.5 (Note 4)	See “Note 4” for basis of change of pH threshold. This reduces set change at this pH transition. Eqn at pH 6.5, H=10, DOC=5 → 160 ug/L
95% LoP. pH > 6.5	exp(0.645×ln(DOC) + 2.255×ln(Hardness) + 1.995×pH + (- 0.284×ln(Hardness)×pH) -9.898) *Note if algorithm is ≤ pH 6.5 use 500.	pH: 6.5 – 8.7 Hardness: 10 – 430 mg/L DOC: 0.08 – 12.3 mg/L	
90% LoP	95% LoP / 0.79		The adjustment factor is calculated from the Canadian chronic SSD.
80% LoP	95% LoP / 0.58		As above
Dissolved Copper Guideline Values (µg/L)			
	Chronic Cu GV		
95% LoP	DGV _{0.5} x (DOC/0.5)^0.70 where DGV _{0.5} = 0.73	pH: 6 – 8.5 Hardness: 2 – 400 mg/L DOC: 0.1 – 20 mg/L	
90% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 0.89		
80% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 1.4		
	Acute Cu GV		
95% LoP	exp (-6.6 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	pH: 5 – 8.8 Hardness: 3.9 – 898 mg/L DOC: 0.1 – 30 mg/L	
90% LoP	exp (-6.3 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
80% LoP	exp (-5.8 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
Dissolved Iron Guideline Values (µg/L)			
All LoP	1000	All conditions	
Dissolved Zinc Guideline values (µg/L)			
	Chronic Zn GV		
95% LoP	exp(0.947xln(Hardness) - 0.815xpH + 0.398xln(DOC) + 4.63)	pH: 5.7 – 8.1 Hardness: 15 – 399 mg/L DOC: 0.3 – 22.9 mg/L	
90% LoP	95% LoP / 0.67		
80% LoP	95% LoP / 0.39		
	Acute Zn GV		
95% LoP	exp (2.5 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	pH: 5.4 – 8.5 Hardness: 14 – 826 mg/L DOC: 0.1 – 22 mg/L	
90% LoP	exp (2.9 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
80% LoP	exp (3.4 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
Dissolved Cobalt Guideline values (µg/L)			
	Chronic Co GV		
95% LoP	Exp((0.414xLn(hardness))-1.285)	Hardness range: 52-396 mg/L	CCME (2017). Equations for 90% and 80% protection calculated from CCME chronic data. Note: This has hardness modifier which was not in the ANZECC (2000) guidelines.
90% LoP	Exp((0.414xLn(hardness))-0.427)		
80% LoP	Exp((0.414xLn(hardness))+0.557)		
	Acute Co GV		
95% LoP	95%Chronic CoGV/0.16	Hardness range: 52-396 mg/L	Acute peak estimated based on zinc no effect acute and chronic ratio for index water quality conditions.
90% LoP	95%Chronic CoGV/0.11		
80% LoP	95%Chronic CoGV/0.062		
Dissolved Nickel Guideline values (µg/L)			
	Chronic Ni GV		

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
95% LoP	$11 \times (\text{Hardness}/30)^{0.85}$	Hardness range: 30-400 mg/L. No guidance for pH application range. Normally taken as physiological pH range as used for testing (pH 6.5-8.5)	ANZG (2018) guideline.
90% LoP	$13 \times (\text{Hardness}/30)^{0.85}$		
80% LoP	$17 \times (\text{Hardness}/30)^{0.85}$		
	Acute Ni GV		
95% LoP	$95\% \text{Chronic NiGV}/0.16$	Hardness range: 30-400 mg/L	Acute peak estimated based on zinc no effect acute and chronic ratio for index water quality conditions.
90% LoP	$95\% \text{Chronic NiGV}/0.11$		
80% LoP	$95\% \text{Chronic NiGV}/0.062$		
	Dissolved Manganese Guideline values (µg/L)		
	Chronic Mn GV		
95% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.46))$	Hardness range: 25-670 mg/L Simplified equation for hardness only calculated at pH 7.5. Look-up tables provided for pH 5.8 to 8.4.	CCME (2019). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Note: This has hardness modifier which was not in the ANZECC (2000) guidelines.
90% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.89))$		
80% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 5.38))$		
	Acute Mn GV		
95% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 4.84)))/2.13$	Hardness range: 25-250 mg/L	CCME (2019). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024).
90% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 6.90)))/2.13$		
80% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 7.20)))/2.13$		
	Dissolved Cadmium Guideline values (GVs, µg/L)		
	Chronic Cd GV		CCME (2014)
95% LoP	$10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}$	Hardness range: 17-280 mg/L	CCME (2014). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection.
90% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 1.84$		
80% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 4.15$		
	Acute Cd GV		
95% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/2.13$	Hardness range: 5.3-360 mg/L	CCME (2014) acute dataset. Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024).
90% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/2.77$		
80% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/9.58$		
	Nitrate-N (ANZG – hardness (H)-dependent; guideline)		
	Chronic Nitrate-N GV		
95% LoP	1100 (H<30); 2600 (H30-150); 29,000 (H >150)	Hardness dependent	ANZG (2025a)
90% LoP	1500 (H<30); 4200 (H30-150); 38,000 (H >150)		
80% LoP	2300 (H<30); 7100 (H30-150); 56,000 (H >150)		
	Acute Nitrate-NGV		
	Not available		

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
	Nitrate-N (NPS-FM; standard)		
	Chronic Nitrate-N Standard (median standard)		MfE (2020)
95% LoP	2400		
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	Acute Nitrate-N Standard (95th percentile standard)		
95% LoP	3500		
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	Chronic ammoniacal-N (ANZG guideline)		
95% LoP	1200	pH and temperature dependent. Values at pH 7 and 15°C.	ANZG (2026)
90% LoP	2000		
80% LoP	3600		
	Acute ammoniacal-N (ANZG guideline)		
	Not available		
	Chronic ammoniacal-N (NPS-FM median standard)		
95% LoP	580	pH dependent. Values at pH 7.	
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	Acute ammoniacal-N (NPS-FM 95th percentile standard)		
95% LoP	968	pH dependent. Values at pH 8.	
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	pH		
	Maintain in range 4.5 – 7.0 for WTP discharge		pH: Upper pH to be confirmed from bryophyte analysis for sites with differing levels of protection.

Note 1: The level of protection (LoP) values are species protection levels based on narrative descriptors from ANZG (2018).

Note 2: The compliance range for pH at Smokestack is 4.5 to 7.0. The equations vary in their calibrated TMF ranges. For monitored water quality values less than the lowest calibrated TMF value the calculated guideline value (GV) will apply to that monitoring occasion.

Note 3: Toxicity modifying factors (TMFs) are pH, hardness (calcium and magnesium concentrations) and dissolved organic carbon (DOC, measured as dissolved purgeable organic carbon (DPOC) in natural waters). For pH, hardness and DOC values exceeding the TMF range use the lowest or highest calculated LoP value (except for dissolved aluminum where a 500 µg/L LoP applies to waters below pH 6.5 for all hardness and DOC concentrations).

Note 4: pH minimum for aluminum is based on the pH transition for Al³⁺ and Al-DOM (dissolved organic matter) binding which have elevated concentrations at lower pH levels. This pH threshold also corresponds to that used in the ANZG (2018) and ANZECC (2000) guidelines for Australia and New Zealand.

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1. Correct nickel equation to calculate as µg/L. Input issue with base ANZG GVs used.
2. Corrected all manganese equations with formula error transcribing from Excel.
3. Changed iron to be µg/L to be consistent with all other GVs.

***2. V3 Revision (121125) notes:**

#	Parameter	Change and comments	Reference
1	Cadmium	New parameter. Adjusted protection levels calculated from SSD through chronic and acute data. Often less than the trace analytical detection limit (Level of Quantitation = LOQ) for sites. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	CCME (2014)
2	Copper	Slope change to 0.70. DOC maxima to 20 mg/L. Very little change to base sensitivities at 0.5 mg/L DOC.	ANZG (2025b)
3	Nitrate_ANZG	New toxicity chronic guideline thresholds added	ANZG (2025a)
4	Nitrate_NPS-FM	Chronic (median) and acute (95 th percentile) standards added.	MfE (2020)
5	Ammonia_ANZG	Chronic guideline thresholds added. Note standardized to pH 8.	ANZG (2018e)
6	Ammonia_NPS-FM	Chronic (median) and acute (95 th percentile) standards added. Note standardized to pH 8. pH adjustment table in Appendix.	MfE (2020); MfE (2018)
7	Cobalt	No change. Suggest using the CCME (2019) as interim pending Stubblefield updating and revision of TMFs. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	
8	Nickel	No change. Suggest using the ANZECC (2000) (as currently in ANZG 2018) as interim pending ANZG updating and revision of guideline. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	ANZG (2018) retains ANZECC (2000)
9	Iron	Retaining 1000 ug/L for iron for all conditions. This is the threshold for iron floc formation in oxygenated circum-neutral pH waters from US EPA (1986) guidance. A very recent iron toxicity guideline has just been released from ANZG (2025f). A fish (fathead minnow) is the most sensitive in this dataset. Fish not present on the plateaux. Recommend that the suitability of the iron guideline be evaluated against future ecological monitoring. The site-specific water chemistry and hydrological regime is the basis for this recommended approach.	US EPA (1986)
10	pH	The recommended pH range for the WTP discharge is 4.5 to 7.0 based on bryophyte communities (pending completion of final report.	
11	Compliance guidance	Add-to-background approach recommended for Waimangaroa compliance sites (Smokestack and downstream) based on the historic mine AMD inputs. This would apply to trace concentration metals: Zn, Cd, Co, Ni. The AMD inputs are highly variable with flow for pH, hardness, DOC, Al, Zn and other trace metal concentrations. This variability in metal concentrations and TMFs are primary justification for the need to adequately account for the upstream concentration variation. Secondarily, macroinvertebrate monitoring and chemistry indicates these are “Highly disturbed system” sites warranting a 90% LoP. There are no fish present at these sites. Toxicity testing of koura indicates a high tolerance of these metals. Mayfly (Deleatidium) testing shows a high tolerance of Co and Ni at both pH 5.5 and pH 7 acute and chronic exposure periods. Other ESE and MFS sites would use the 95% LoP as the GV for assessments downstream of WTP and by-pass discharges.	

		The consent conditions need to incorporate a removal of Cd, Co, Ni if they are at the trace LOQ for multiple monitoring occasions.	
12	Aluminon testing	Aluminon test proposed to better resolve the bioavailable aluminium fraction for longitudinal stream surveys and for sump monitoring. This testing should also be applied to receiving water dilutions with by-pass sump waters if they are low pH and have high Al concentrations. Conditions to be added to consent conditions.	
13	Equation spreadsheet	Calculates GV's for metals for different TMF conditions. Nitrate-N and ammoniacal-N not in spreadsheet.	

References

ANZG 2025b Toxicant default guideline values for aquatic ecosystem protection: Dissolved copper in freshwater, p. 56, Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2025a Toxicant default guideline values for aquatic ecosystem protection: Nitrate in freshwater, p. 35, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2025f Toxicant default guideline values for aquatic ecosystem protection: Iron in freshwater, p. 36, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand governments and Australian state and territory governments.

ANZG 2018e Ammonia in freshwater and marine water (<https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/toxicants/ammonia-2000>), Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

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MfE 2020c National Policy Statement for Freshwater Management 2020 - October 2024, p. 75, Ministry for the Environment, Wellington.

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US EPA 1986 Quality criteria for water (Gold book) 1986, p. 395, United States Environmental Protection Agency, Office of Water, Regulation and Standards Division, Washington D.C.

Revision v4, 190326

#	Parameter	Change and comments	Reference
1	Ammonia	New ammoniacal-N guidelines added for toxicity. pH and temperature dependent. Table has Values at pH 7 and 15°C. Reference and tables in Appendix B.	ANZG 2026
2	Ammonia	NPS-FM standards. Adjusted to pH 7 to be comparable with the new ANZG (2026)	
3	Spreadsheet	Updated	
4		Calculations tables 6-1 and 6-2 as in Hickey (2026a) in Appendix C	
5	Turbidity guidelines	Changes (in bold): +5 NTU median above background "Now "Performance". Has 25 NTU 15-sample rolling median The 15-sample allows for variable sampling intensity.	

MfE (2018) A Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management (as amended 2017). p. 47. Ministry for the Environment, Wellington.

Appendix – Ammonia adjustment calculations

ANZECC (2000, Section 8.3.7.2) observes that total ammoniacal nitrogen, $\text{NH}_4\text{-N}$ (often referred to as 'total ammonia'), 'refers to two chemical species that are in equilibrium in water: the un-ionised ammonia, NH_3 , and the ionised ammonium ion, NH_4^+ .' And, 'The proportion of the two chemical forms varies with the physico-chemical properties of the water, particularly pH and temperature.'

However, as the name 'total ammonia' implies, the combined amount of these two chemical species is constant, and it does not vary with the physico-chemical properties of the water. That is, 'adjusting' the ammonia concentration for pH does not mean that the amount of total ammonia present changes (and in fact the standard laboratory analysis for $\text{NH}_4\text{-N}$ is successfully carried out at a high pH, e.g. pH 11).

Instead, pH adjustment means calculating the amount of $\text{NH}_4\text{-N}$ at pH 8 that would have the equivalent toxicity to the amount of $\text{NH}_4\text{-N}$ measured in the sample at the pH of the sample – whatever that may have been. That is, the calculation produces the concentration of $\text{NH}_4\text{-N}$ which at pH 8 would have the same toxicity as the observed (ie, unadjusted) $\text{NH}_4\text{-N}$ concentration would have at the observed pH.

The information in table 10 allows the ammonia concentration of a sample to be converted to an equivalent concentration at pH 8 using the following equation:

$$\text{Conc}_{\text{pH } 8} = \frac{\text{Conc}_{\text{pH sample}}}{\text{Ratio}} \quad \text{Equation (1)}$$

Where $\text{Conc}_{\text{pH sample}}$ is the concentration of the sample and Ratio is read from table 10 for the given sample pH.

For example, if a sample was observed with 1.12 mg $\text{NH}_4\text{-N/L}$ at pH 7.5, the adjusted concentration to use in calculating sample statistics would be 0.63 mg $\text{NH}_4\text{-N/L}$ at pH 8. This is derived as follows:

Using equation (1) and table 10:

$$\text{Conc}_{\text{pH } 8} = 0.63 = \frac{1.12}{1.79}$$

Where the numerator (1.12) is the observed sample concentration and the denominator (1.79) is the Ratio from table 10 at pH of 7.5.

That is, although there is still 1.12 mg/L of $\text{NH}_4\text{-N}$ present in the sample, the adjustment process has identified that the toxicity of this sample at pH 7.5 is equivalent to the toxicity associated with a $\text{NH}_4\text{-N}$ concentration of 0.63 mg/L at pH 8. It's the equivalent toxicity that has been adjusted, and not the amount of $\text{NH}_4\text{-N}$ present in the sample (which remains unchanged).

Note that a method for converting to standard temperature is not currently available.

Table 10: Conversion ratios for pH adjustment of ammonia concentrations

Sample pH	Ratio	Sample pH	Ratio	Sample pH	Ratio
6	2.86	7	2.42	8.1	0.87
6.1	2.84	7.1	2.32	8.2	0.73
6.2	2.82	7.2	2.21	8.3	0.62
6.3	2.80	7.3	2.09	8.4	0.53
6.4	2.77	7.4	1.94	8.5	0.44
6.5	2.73	7.5	1.79	8.6	0.38
6.6	2.70	7.6	1.63	8.7	0.32
6.7	2.64	7.7	1.47	8.8	0.27
6.8	2.59	7.8	1.31	8.9	0.23
6.9	2.51	7.9	1.14	9	0.20
		8	1.00	>9	0.20

Source: Adapted from ANZECC (2000) and Hickey (2014).

Appendix B: ANZG (2026) ammonia toxicity-Temperature and pH tables

ANZG (2026c) Toxicant default guideline values for aquatic ecosystem protection: Ammonia in freshwater. In: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. CC BY 4.0. p. 47. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

Appendix F section from Hickey (2026):

1.1 Ammoniacal-N

1.1.1 ANZG (2026) – ammoniacal-N pH and temperature correction

The ANZG ammoniacal-N guidelines have recently been updated and include both pH and temperature TMFs (ANZG, 2026c). The DGVs are shown in Table F-29 with pH and temperature look-up tables for 95%, 90% and 80% protection shown in Tables F-30-F-32.

Table F-29: DGV values for total ammoniacal-N in freshwater (Table 4 from ANZG 2026c).

Level of species protection (%)	Default guideline value (mg/L) at pH 7, temperature 20°C	Default guideline value (mg/L) at pH 7.5, temperature 20°C	Default guideline value (mg/L) at pH 8, temperature 20°C
99	0.32	0.24	0.13
95	0.97	0.72	0.40
90	1.6	1.2	0.68
80	3.0	2.3	1.3

^a See Appendix E for ammonia default guideline values applicable to a range of pH and temperatures.

^b The default guideline values were derived using the shinyssdtools (version 0.2.0) software and are reported to 2 significant figures. They are not applicable to waters of low ionic strength (e.g. < 50 µS/cm).

Table F-30: Freshwater 95% LoP values for ammoniacal-N at different pH and temperature values (Table E2 – pH range reduced – from ANZG 2026c).

Table E.2 Freshwater 95% species-protection guideline values for total ammonia (mg/L N) at different pH and temperature

Temp. (°C)	pH															
	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5
10	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.5	1.4	1.3	1.2	1.2
11	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.2	1.1
12	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.2	1.1	1.0
13	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.1	0.99
14	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.0	0.94
15	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.98	0.90
16	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	0.93	0.86
17	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	0.95	0.89	0.82
18	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.13	1.10	1.1	1.0	0.97	0.91	0.85	0.78
19	1.2	1.2	1.2	1.2	1.2	1.15	1.13	1.11	1.09	1.06	1.0	0.98	0.93	0.88	0.82	0.75
20	1.1	1.1	1.1	1.1	1.1	1.09	1.08	1.06	1.03	1.00	0.97	0.93	0.88	0.83	0.78	0.72
21	1.1	1.1	1.1	1.0	1.0	1.03	1.01	0.99	0.97	0.94	0.91	0.87	0.83	0.78	0.73	0.67
22	1.0	1.0	1.0	1.0	1.0	0.99	0.98	0.96	0.94	0.91	0.88	0.84	0.80	0.76	0.71	0.65
23	0.98	0.98	0.97	0.96	0.95	0.94	0.93	0.91	0.89	0.87	0.84	0.80	0.76	0.72	0.67	0.62
24	0.93	0.92	0.92	0.91	0.90	0.89	0.88	0.86	0.84	0.82	0.79	0.76	0.72	0.68	0.63	0.58
25	0.88	0.88	0.87	0.87	0.86	0.85	0.83	0.82	0.80	0.78	0.75	0.72	0.68	0.65	0.60	0.55
26	0.84	0.83	0.83	0.82	0.81	0.80	0.79	0.78	0.76	0.74	0.71	0.68	0.65	0.61	0.57	0.53
27	0.79	0.79	0.78	0.78	0.77	0.76	0.75	0.74	0.72	0.70	0.68	0.65	0.62	0.58	0.54	0.50
28	0.75	0.75	0.74	0.74	0.73	0.72	0.71	0.70	0.68	0.66	0.64	0.61	0.58	0.55	0.51	0.47
29	0.71	0.71	0.70	0.70	0.69	0.68	0.67	0.66	0.64	0.62	0.60	0.58	0.55	0.52	0.48	0.45
30	0.66	0.66	0.66	0.65	0.65	0.64	0.63	0.62	0.60	0.58	0.57	0.54	0.52	0.49	0.45	0.42

Table F-31: Freshwater 905% LoP values for ammoniacal-N at different pH and temperature values (Table E3 – pH range reduced – from ANZG 2026c).

Table E.3 Freshwater 90% species-protection guideline values for total ammonia (mg/L N) at different pH and temperature

Temp. (°C)	pH															
	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5
10	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.6	2.5	2.4	2.3	2.2	2.1	1.9	1.8
11	2.8	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.7
12	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.4	2.4	2.3	2.2	2.2	2.0	1.9	1.8	1.7
13	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.0	1.8	1.7	1.6
14	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.2	2.1	2.1	2.0	1.9	1.8	1.7	1.5
15	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.0	1.9	1.8	1.7	1.6	1.5
16	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.8	1.7	1.6	1.5	1.4
17	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.6	1.5	1.4
18	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.5	1.4	1.3
19	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.5	1.4	1.3
20	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.2
21	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.5	1.4	1.3	1.3	1.2
22	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.3	1.2	1.1
23	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.3	1.2	1.2	1.1
24	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.0
25	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.1	1.1	0.98
26	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.93
27	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.97	0.89
28	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	0.99	0.92	0.85
29	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	0.95	0.88	0.81
30	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.95	0.90	0.84	0.77

Table 6-1: Summary of sources for guidelines used in this assessment. See text for details.

Toxicant	Test type	Status	Reference
Aluminium (Al)	Long-term (chronic)	CCME used for pH>6.5 with TMFs	US EPA (2018); CCME (2021)
Cadmium (Cd)	Short-term; Long-term	CCME acute and chronic guidelines used with TMFs.	CCME (2014)
Chromium (Cr(III))	Long-term	Screening guideline ^a	(ANZG, 2026b)
Cobalt (Co)	Short-term; Long-term	CCME used with TMFs	CCME (2017) ^b
Copper (Cu)	Short-term; Long-term	NZ (acute) with TMFs; ANZG (chronic) with TMFs	Gadd et al. (2024) (NZ acute); ANZG (2026a) ^c
Iron (Fe)	Long-term	US EPA used	Brix et al. (2023); ANZG (2025f); CCME (2024); (US EPA, 1986)
Lead (Pb)	Short-term; Long-term	Screening guideline with TMFs	CCME (2020)
Manganese (Mn)	Short-term; Long-term	CCME used with TMFs	CCME (2019)
Nickel (Ni)	Short-term; Long-term	ANZG used with TMFs	ANZG (2018a); Stauber et al. (2021) ^d
Zinc (Zn)	Short-term; Long-term	NZ (acute) used with TMFs; CCME (chronic) used with TMFs	Gadd et al. (2024) (NZ acute); ANZG (2024) ^d ; CCME (2018a); CCME (2018b)

^a Guideline used for screening for PCOCs in WLBMs with TMFs (if appropriate).

^b Guideline in process of revision for international application.

^c Updated ANZG used as in final review.

^d ANZG guideline in process of revision but not completed. Draft guideline not used.

Table 6-2: Bioavailability guideline value (GV) equations for chronic GV and acute GV for differing levels of protection (LoP). Toxicity modifier factor (TMF) range for pH, hardness (as CaCO₃) and DOC indicated.

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Reference
Dissolved Aluminium Guideline Values (µg/L)			
	Chronic Aluminium GV		
95% LoP. pH ≤ 6.5	500	pH: ≤ 6.5 (Note 4 for basis of change of pH threshold)	a
95% LoP. pH > 6.5	exp(0.645×ln(DOC) + 2.255×ln(Hardness) + 1.995×pH + (-0.284×ln(Hardness)×pH) -9.898) *Note if algorithm is ≤ pH 6.5 use 500.	pH: 6.5 – 8.7 Hardness: 10 – 430 mg/L DOC: 0.08 – 12.3 mg/L	b
90% LoP	95% LoP / 0.79		b
80% LoP	95% LoP / 0.58		b
Dissolved Copper Guideline Values (µg/L)			
	Chronic Cu GV		
95% LoP	DGV _{0.5} x (DOC/0.5)^0.70 where DGV _{0.5} = 0.73	pH: 6 – 8.5 Hardness: 2 – 400 mg/L DOC: 0.1 – 20 mg/L	c
90% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 0.89		
80% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 1.4		
	Acute Cu GV		
95% LoP	exp (-6.6 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	pH: 5 – 8.8 Hardness: 3.9 – 898 mg/L DOC: 0.1 – 30 mg/L	d
90% LoP	exp (-6.3 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
80% LoP	exp (-5.8 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
Dissolved Iron Guideline Values (µg/L)			
All LoP	1000	All conditions	e
Dissolved Zinc Guideline values (µg/L)			
	Chronic Zn GV		
95% LoP	exp(0.947xln(Hardness) - 0.815xpH + 0.398xln(DOC) + 4.63)	pH: 5.7 – 8.1 Hardness: 15 – 399 mg/L DOC: 0.3 – 22.9 mg/L	f
90% LoP	95% LoP / 0.62		
80% LoP	95% LoP / 0.35		
	Acute Zn GV		
95% LoP	exp (2.5 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	pH: 5.4 – 8.5 Hardness: 14 – 826 mg/L DOC: 0.1 – 22 mg/L	g
90% LoP	exp (2.9 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
80% LoP	exp (3.4 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
Dissolved Cobalt Guideline values (µg/L)			
	Chronic Co GV		
95% LoP	Exp((0.414xLn(hardness)-1.285)	Hardness range: 52-396 mg/L	h
90% LoP	Exp((0.414xLn(hardness)-0.427)		
80% LoP	Exp((0.414xLn(hardness)+0.557)		
	Acute Co GV		
95% LoP	95%Chronic CoGV/0.16	Hardness range: 52-396 mg/L	i
90% LoP	95%Chronic CoGV/0.11		
80% LoP	95%Chronic CoGV/0.062		
Dissolved Nickel Guideline values (µg/L)			
	Chronic Ni GV		
95% LoP	11x(Hardness/30)^0.85	Hardness range: 30-400 mg/L. No guidance for pH application range. Normally taken as physiological pH range as used for testing (pH 6.5-8.5).	j
90% LoP	13x(Hardness/30)^0.85		
80% LoP	17x(Hardness/30)^0.85		
	Acute Ni GV		
95% LoP	95%Chronic NiGV/0.16	Hardness range: 30-400 mg/L	k
90% LoP	95%Chronic NiGV/0.11		
80% LoP	95%Chronic NiGV/0.062		
Dissolved Manganese Guideline values (µg/L)			
	Chronic Mn GV		
95% LoP	Exp((0.411xLn(hardness)+4.46)	Hardness range: 25-670 mg/L	l

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Reference
90% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.89))$	Simplified equation for hardness only calculated at pH 7.5. Look-up tables provided for pH 5.8 to 8.4.	
80% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 5.38))$		
	Acute Mn GV		
95% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 4.84)))/2.13$	Hardness range: 25-250 mg/L	m
90% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 6.90)))/2.13$		
80% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 7.20)))/2.13$		
	Dissolved Cadmium Guideline values (GVs, µg/L)		
	Chronic Cd GV		
95% LoP	$10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}$	Hardness range: 17-280 mg/L	n
90% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 1.84$		
80% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 4.15$		
	Acute Cd GV		
95% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)}) \times 0.47$	Hardness range: 5.3-360 mg/L	o
90% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)}) \times 0.61$		
80% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)}) \times 2.1$		
	Nitrate-N (ANZG – hardness (H)-dependent; guideline)		
	Chronic Nitrate-N GV		
95% LoP	1100 (H<30); 2600 (H30-150); 29,000 (H >150)	Hardness dependent	p
90% LoP	1500 (H<30); 4200 (H30-150); 38,000 (H >150)		
80% LoP	2300 (H<30); 7100 (H30-150); 56,000 (H >150)		
	Acute Nitrate-NGV		
	Not available		
	Nitrate-N (NPS-FM; standard)		
	Chronic Nitrate-N Standard (median standard)		
95% LoP	2400		q
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Acute Nitrate-N Standard (95th percentile standard)		
95% LoP	3500		q
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Chronic ammoniacal-N (ANZG guideline)		
95% LoP	1200	pH and temperature dependent. Values at pH 7 and 15°C.	r
90% LoP	2000		
80% LoP	3600		
	Acute ammoniacal-N (ANZG guideline)		
	Not available		
	Chronic ammoniacal-N (NPS-FM median standard)		
95% LoP	580	pH dependent. Values at pH 7.	s
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Acute ammoniacal-N (NPS-FM 95th percentile standard)		
95% LoP	968	pH dependent. Values at pH 7.	s
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	pH		
	Maintain in range 4.5 – 7.0 for WTP discharge		t

Note 1: The level of protection (LoP) values are species protection levels based on narrative descriptors from ANZG (2018). Site-specific classification levels for ESE and MFS streams have been developed (Hickey, 2026b).

Note 2: The compliance range for pH at Smokestack is 4.5 to 7.0. The equations vary in their calibrated TMF ranges. For monitored water quality values less than the lowest calibrated TMF value the calculated guideline value (GV) will apply to that monitoring occasion.

Note 3: Toxicity modifying factors (TMFs) are pH, hardness (calcium and magnesium concentrations) and dissolved organic carbon (DOC, measured as dissolved purgeable organic carbon (DPOC) in natural waters).

For pH, hardness and DOC values exceeding the TMF range use the lowest or highest calculated LoP value (except for dissolved aluminum where a 500 µg/L LoP applies to waters below pH 6.5 for all hardness and DOC concentrations).

Note 4: pH minimum for aluminum is based on the pH transition for Al³⁺ and Al-DOM (dissolved organic matter) binding which have elevated concentrations at lower pH levels. This pH threshold also corresponds to that used in the ANZG (2018) and ANZECC (2000) guidelines for Australia and New Zealand.

References: (a) Chronic GV for pH ≤ 6.5 from Hickey (2012) derivation using BLM approach; (b) Chronic GV for 95% LoP from CCME (2021) for pH > 6.5 . Reduced LoPs calculated from CCME chronic dataset. No acute sensitivity data in CCME dataset so no acute GVs calculated; (c) Chronic GVs for copper from ANZG (2026a); (d) Acute GVs for copper from Gadd et al. (2024); (e) Iron GV from Hickey (2012) originating from US EPA (1986) to prevent floc on bed; (f) Chronic GV for zinc from CCME (2018b). Reduced LoPs calculated from CCME chronic dataset; (g) Acute GVs for zinc from Gadd et al. (2024); (h) Chronic GVs for cobalt from CCME (2017). Reduced LoPs calculated from CCME chronic dataset; (i) Acute GVs for cobalt based on CCME (2017) chronic dataset with acute no effect thresholds from acute/chronic ratio from zinc sensitivity Gadd et al. (2024). These Canadian GVs are considered interim with updated GVs being derived with MLR and BLM approaches by Stubblefield based on their earlier publication (Stubblefield et al., 2020); (j) Chronic nickel GVs from ANZG (2018a); (k) Acute GVs for nickel from ANZG (2018a) acute no effect thresholds from acute/chronic ratio from zinc sensitivity Gadd et al. (2024); (l) Chronic manganese GVs from CCME (2019). Reduced LoPs calculated from CCME chronic dataset; (m) Acute manganese GVs calculated from CCME (2019) chronic data adjusted from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al., 2024); (n) Chronic cadmium GVs from CCME (2014). Reduced LoPs calculated from CCME chronic dataset; (o) Acute GVs for cadmium based on CCME (2014) dataset. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024); (p) Chronic GVs for nitrate from ANZG (2025a); (q) Nitrate standards (chronic and acute for median and 95th percentile compliance, respectively) from MfE (2020c); (r) Chronic ammoniacal-N guidelines from ANZG (2026c), based on ANZECC/ARMCANZ (2000); (s) Ammoniacal-N standards (chronic and acute for median and 95th percentile compliance, respectively) from MfE (2020c). pH adjustment to pH 7 (2.42-times increase from pH 8 default) from MfE (2018); (t) Upper and lower pH range from bryophyte species distribution range for Buller Plateaux streams from Hogsden and Hickey (2025).

Appendix D: Turbidity table as in Hickey 2026a

Table 7-1: Summary of site-specific turbidity guideline values for short- and long-term protection of ecological communities, aesthetic and performance. Proposed compliance locations for Escarpment and Mount Frederick South mine water discharges shown in Appendix E. Allowable compliance assessment exceedance frequencies shown in Appendix K.

Classification/Nominal protection level	Short-term (acute) turbidity (NTU) maximum/limit, exposure period	Long-term (chronic) turbidity (NTU) median/95 th percentile/exposure reporting period
Ecological – continuous ^{a,e}	550 max ^a /200, 7-d rolling median	+5 NTU median above background/+20 NTU 95 th percentile/annual
Ecological – discrete ^{b,e}	550 max ^a	As above
Aesthetic ^{c,e}	n/a	+50% change from background for median and 95 th percentile background; >1.6 m median clarity ^f
Performance ^{d,e}	n/a	25 NTU 15-sample rolling median

^a Continuous monitoring with 10-min logging frequency and targeting >90% data capture after quality control and clean up procedures for reporting period – to exclude potential spurious instrumental values or debris contacting probe. The 7-d rolling median assessed weekly based on telemetered data. Discrete daily sampling should be used for easily accessible sites upstream and downstream of a WTP. Sites must have reliable access for sample collection during high flow events.

^b Discrete compliance assessment will differ with monitoring frequency (see Appendix E).

^c Aesthetic compliance assessment for mine-related effects based on continuous monitoring at plateau compliance sites and calculated flow adjustment. Weekly or monthly discrete sampling at SH67 to validate upstream monitoring adjustments (Compliance assessment for discrete monitoring sample numbers provided in Appendix K).

^d Proposed limit for “Performance” assumed to be based on weekly or monthly discrete sampling (see Appendix E). Key sites could be assessed based on continuous (10-min averaging) or discrete daily monitoring.

^e All measurements to exclude “extreme event” flood conditions. A proposed 1 in 10-year rainfall event is proposed as an extreme event (see text).

^f A site-specific relationship between turbidity and visual clarity will need to be developed from representative stream samples.

APPENDIX C – DETAILED TEST RESULTS

	Test		1			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		14-08-24	14-08-24	14-08-24	14-08-24
	Time		16:07	16:07	16:07	16:07
	Raw Water pH	pH	3.01	3.01	3.01	3.01
	Raw Water UVT	%	27.20	27.20	27.20	27.20
	Raw Water Turbidity	NTU	26.83	26.83	26.83	26.83
	Jar - 1 litre					
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.5	1.25	1.5	1.25
	Neutralent Dose	mg/L	300	250	300	250
	Rapid Mix Speed	rpm	300	300	300	300
	Rapid Mix Time	min	20	20	20	20
	Adjusted pH	pH	9.06	6.44	6.09	5.65
Coagulant /Chelant	Coagulation/Chelation chem					
	Coag Conc	%				
	Coag amount	mL				
	Coag dose	mg/L				
	Rapid Mix Speed	rpm				
	Rapid Mix Time	min				
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer					
	Floc/Poly Conc	%				
	Floc/Poly amount	mL				
	Floc/Poly dose	mg/L				
	Rapid Mix Speed	rpm				
	Rapid Mix Time	min				
	pH after rapid mix	pH				
Flocculation Stage	Floc after rapid mix	A-G				
	Slow Mix Speed	rpm				
	Slow Mix Time	min				
	pH after slow mix	pH				
	Floc after slow mix	A-G				
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm				
	Distance Settled After 5 min	mm				
	Distance Settled After 10 min	mm				
	Distance Settled After 20 min	mm	85	85	85	85
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH	7.38	6.72	6.16	5.81
	Supernatant UVT	%	91.5	90.8	88.8	86.7
	Supernatant Turbidity	NTU	4.83	2.74	3.13	4.05

	Test		1			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		14-08-24	14-08-24	14-08-24	14-08-24
	Time		16:07	16:07	16:07	16:07
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
	Nickel	mg/L				
Other Parameters	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes					
pH during fast mix (Neutralent added)						
	pH After 1 min	pH				
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				
	pH After 15 min	pH				
	pH After 20 min	pH				
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				

	Test		2			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		15-08-24	15-08-24	15-08-24	15-08-24
	Time					
	Raw Water pH	pH	3.99	3.99	3.99	3.99
	Raw Water UVT	%	29.40	29.40	29.40	29.40
	Raw Water Turbidity	NTU	43.59	43.59	43.59	43.59
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.4	1.4	1.1	1.1
	Neutralent Dose	mg/L	280	280	220	220
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH	9.63	9.28	6.96	6.96
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	1	2	1	2
	Coag dose	mg/L	1	2	1	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	0.5	1	0.5	1
	Floc/Poly dose	mg/L	0.5	1	0.5	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
	pH after rapid mix	pH	9.74	9.51	8.22	8.06
Flocculation Stage	Floc after rapid mix	A-G	D	E-F	D-E	G
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH	9.58	9.33	7.88	7.93
	Floc after slow mix	A-G	E-F	E-F	C-D	F-G
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	60	70	80	70
	Distance Settled After 5 min	mm	210	250	230	250
	Distance Settled After 10 min	mm	265	270	265	275
	Distance Settled After 20 min	mm	280	280	280	285
	Distance Settled After 30min	mm	288	285	285	290
	Settled depth	mm				
	Supernatant pH	pH	8.69	8.83/8.77	7.22	7.09
Supernatant Testing	Supernatant UVT	%	94.4	97.2	95.3	95.8
	Supernatant Turbidity	NTU	2.71/2.82	1.3	2.76	1.15

	Test		2			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount	No sediment No sediment No sediment No sediment					
	Date		15-08-24	15-08-24	15-08-24	15-08-24
	Time					
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Fluffy floc, not clear settling profile at 5 mins			
pH during fast mix (Neutralent added)						
	pH After 1 min	pH				
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				
	pH After 15 min	pH				
	pH After 20 min	pH				
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				

	Test		3			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount	No sediment No sediment No sediment No sediment					
	Date		15-08-24	15-08-24	15-08-24	15-08-24
	Time		15:30	15:30	15:30	15:30
	Raw Water pH	pH				
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.3	1.3	1	1
	Neutralent Dose	mg/L	260	260	200	200
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH	7.79/8.16	7.84/8.55	4.87/5.40	4.85/5.36
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	1	2	1	2
	Coag dose	mg/L	1	2	1	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	0.5	1	0.5	1
	Floc/Poly dose	mg/L	0.5	1	0.5	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
	pH after rapid mix	pH	7.66	8.52	6.27	5.94
Flocculation Stage	Floc after rapid mix	A-G				
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G	E	E-F	B-C	D-E
Settling	Settling Cylinder/Jar					
Stage	Distance Settled After 1 min	mm	1-00	60	25	1-00
	Distance Settled After 5 min	mm	240	255	240	250
	Distance Settled After 10 min	mm	260	275	266	270
	Distance Settled After 20 min	mm	275	288	285	284
	Distance Settled After 30min	mm	280	285	285	285
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH	7.6	7.8	5.96	5.74
	Supernatant UVT	%	95.2	95.85	93	92.8
	Supernatant Turbidity	NTU	1.53	1.37	1.45	1.38

	Test		3			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		15-08-24	15-08-24	15-08-24	15-08-24
	Time		15:30	15:30	15:30	15:30
In House Dissolved Metals	Aluminium	mg/L		0.246		
	Cobalt	mg/L		-0.005		
	Iron	mg/L				
	Magnesium	mg/L		0.006		
	Manganese High range	mg/L		0.8		
Other Parameters	Nickel	mg/L		0.012		
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Fluffy floc	Best settling result so tested metals of this one	Fluffy floc	Fluffy floc
pH during fast mix (Neutralent added)						
	pH After 1 min	pH				
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				
	pH After 15 min	pH				
	pH After 20 min	pH				
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				

	Test		4			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		16-08-24	16-08-24	16-08-24	16-08-24
	Time					
	Raw Water pH	pH				
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
Neutralent Addition	Jar - 1 litre		1.0g	3g	1.0g	3.0g
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.3	1.3	1	1
	Neutralent Dose	mg/L	260	260	200	200
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2	2	2	2
	Coag dose	mg/L	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	1
	Floc/Poly dose	mg/L	1	1	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculation Stage	pH after rapid mix	pH	8.15	8.19	6.61	6.22
	Floc after rapid mix	A-G	F-G	F-G	E-F	E-F
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH	8.01	8.13	6.21	6.09
	Floc after slow mix	A-G				
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	100	60	10	40
	Distance Settled After 5 min	mm	4mins 265	4mins 260	4mins 220 Fluffy	240 Fluffy
	Distance Settled After 10 min	mm	285	283	275	275
	Distance Settled After 20 min	mm	290	290	288	288
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH	6.42	6.98	5.51	5.56
	Supernatant UVT	%	94.3	91.7	93	90.5
	Supernatant Turbidity	NTU	1.06	2	1.41	1.65

	Test		4			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		16-08-24	16-08-24	16-08-24	16-08-24
	Time					
In House Dissolved Metals	Aluminium	mg/L	0.22	0.161	0.728	0.477
	Cobalt	mg/L	0.005	-0.004	0.078	0.06
	Iron	mg/L	0.01	0.002	0.042	0.029
	Magnesium	mg/L				
	Manganese High range	mg/L	1.1	1.2	2.2	2.4
Other Parameters	Nickel	mg/L	0.03	0.017	0.191	0.305
	Hardness	mg/L	707			
	Alkalinity	mg/L	80.3			
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Supernatant temp 5.4 degrees. Sediment 10L at 3g/L 30g. 2 lots of 100mls into 2 jars top up with no sediment.			
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	5.2	5.6	4.5	4.57
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	6.82	7.02	4.74	4.77
	pH After 10 min	pH	7.56	7.67	5.02	5.05
	pH After 15 min	pH				
	pH After 20 min	pH	8.18	8.38	5.54	5.55
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				

	Test	5				
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		16-08-24	16-08-24	16-08-24	16-08-24
	Time		15:40	15:40	15:40	15:40
	Raw Water pH	pH	2.85			
	Raw Water UVT	%	29.40			
	Raw Water Turbidity	NTU	27.3			
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		MgO	MgO	MgO	MgO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.5	1.3	1	0.8
	Neutralent Dose	mg/L	300	260	200	160
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	0	0	0	0
	Coag dose	mg/L				
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	0	0	0	0
	Floc/Poly dose	mg/L	0	0	0	0
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculation Stage	pH after rapid mix	pH				
	Floc after rapid mix	A-G				
	Slow Mix Speed	rpm				
	Slow Mix Time	min				
	pH after slow mix	pH				
	Floc after slow mix	A-G				
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm				
	Distance Settled After 5 min	mm				
	Distance Settled After 10 min	mm				
	Distance Settled After 20 min	mm				
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		5			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		16-08-24	16-08-24	16-08-24	16-08-24
	Time		15:40	15:40	15:40	15:40
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Trial test, no settling, no supernatant taken.			
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	3.6	3.56	3.51	3.49
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	4.22	4.18	4.06	3.95
	pH After 10 min	pH	4.28	4.22	4.16	4.11
	pH After 15 min	pH	4.28	4.23	4.18	4.15
	pH After 20 min	pH	4.31	4.25	4.19	4.17
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				

	Test		6			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		19-08-24	19-08-24	19-08-24	19-08-24
	Time		11:00	11:00	11:00	11:00
	Raw Water pH	pH	2.99	2.99	2.99	2.99
	Raw Water UVT	%	32.10	32.10	32.10	32.10
	Raw Water Turbidity	NTU	34.05	34.05	34.05	34.05
Neutralent Addition	Jar - 1 litre		sediment 1	3	1	3
	Chem added/Mgo/CaO etc		MgO	MgO	MgO	MgO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	4.5	4.5	3	3
	Neutralent Dose	mg/L	900	900	600	600
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2	2	2	2
	Coag dose	mg/L	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	1
	Floc/Poly dose	mg/L	1	1	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculation Stage	pH after rapid mix	pH	8.47	8.5	8	7.88
	Floc after rapid mix	A-G				
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min				
	pH after slow mix	pH				
	Floc after slow mix	A-G	Pin	Pin	B	B
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	313	313	313	310
	Distance Settled After 5 min	mm	Pins with no interface through all, with large flocs settling immediately. Pins falling very slowly. There is surface			
	Distance Settled After 10 min	mm				
	Distance Settled After 20 min	mm	Floc suspended			
	Distance Settled After 30min	mm				
	Settled depth	mm				
	Supernatant Testing	Supernatant pH	pH	7.1	7.18	7.09
	Supernatant UVT	%	93.9	93.7	94	94.3
	Supernatant Turbidity	NTU	3.31	5.2	3.82	7.05

	Test		6			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		19-08-24	19-08-24	19-08-24	19-08-24
	Time		11:00	11:00	11:00	11:00
In House Dissolved Metals	Aluminium	mg/L	0.149	0.135		
	Cobalt	mg/L	0.013	0.004		
	Iron	mg/L	0.002	0.009		
	Magnesium	mg/L				
	Manganese High range	mg/L	1.4	1.8		
Other Parameters	Nickel	mg/L	0.076	0.086		
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Pin right through but large floc almost fully settled at one minute.		Pins dropping	pH 7.88 reached 1-2 mins after adding both Metalsorb and Rheomax
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	4.34	4.43	4.39	4.45
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	4.77	4.81	4.59	4.61
	pH After 10 min	pH	6.22	6.28	4.97	4.98
	pH After 15 min	pH	6.84	6.92	5.91	5.94
	pH After 20 min	pH	8.05	8.13	7.31	7.26
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH	8.36	8.36	7.98	7.83
	pH After 10 min	pH	8.48	8.42	8.03	7.97

	Test		7			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		19-08-24	19-08-24	19-08-24	19-08-24
	Time		13:30	13:30	13:30	13:30
	Raw Water pH	pH	2.93	2.93	2.93	2.93
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
	Jar - 1 litre					
Neutralent Addition	Chem added/Mgo/CaO etc		MgO/CaO	MgO/CaO	MgO/CaO	MgO/CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1-1	1-1	2-1	2-1
	Neutralent Dose	mg/L				
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2	2	2	2
	Coag dose	mg/L	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	1
	Floc/Poly dose	mg/L	1	1	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
	pH after rapid mix	pH	8.08	8.13	8.95	8.98
Flocculation Stage	Floc after rapid mix	A-G	G	G	F	F
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH	8.61	8.83	9.15	9.15
	Floc after slow mix	A-G				
Settling	Settling Cylinder/Jar		After 2 mins 255	255	265	275
Stage	Distance Settled After 1 min	mm	Fluffy floc, no interface. Larger flocs settling.			
	Distance Settled After 5 min	mm	280	285	285	290
	Distance Settled After 10 min	mm	290	288	285	297
	Distance Settled After 20 min	mm	295	290	290	298
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH	7.22	7.61	8.55	8.85
	Supernatant UVT	%	95.6	95.5	96.3	95.8
	Supernatant Turbidity	NTU	1.25	1.17	1.76	2.5

	Test		7			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		19-08-24	19-08-24	19-08-24	19-08-24
	Time		13:30	13:30	13:30	13:30
In House Dissolved Metals	Aluminium	mg/L		0.149		
	Cobalt	mg/L		0.006		
	Iron	mg/L		0.005		
	Magnesium	mg/L				
	Manganese High range	mg/L		1.1		
Other Parameters	Nickel	mg/L		0.028		
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes					
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	4.28	4.86	5.7	5.87
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	6.01	6.01	6.41	6.56
	pH After 10 min	pH	6.65	6.72	7.57	7.86
	pH After 15 min	pH	7.37	7.41	8.41	8.51
	pH After 20 min	pH	8.18	8.27	8.95	8.94
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH				
	pH After 10 min	pH				

	Test		8			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
Sediment amount	Sample		Manchester	Manchester	Manchester	Manchester
			0.3g/L	3g/L	0.3g/L	3g/L
	Date		19-08-24	19-08-24	19-08-24	19-08-24
	Time		14:30	14:30	14:30	14:30
	Raw Water pH	pH				
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		MgO	MgO	MgO	MgO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	2.5	2.5	2	2
	Neutralent Dose	mg/L	500	500	400	400
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2	2	2	2
	Coag dose	mg/L	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	1
	Floc/Poly dose	mg/L	1	1	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
	pH after rapid mix	pH	5.85	5.85	5.05	4.92
Flocculation Stage	Floc after rapid mix	A-G	C-D	C-D	Pin-A	pin-A
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G	Pin	Pin	Pin	Pin
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	No interface	No interface	No interface	No interface
	Distance Settled After 5 min	mm	No interface	No interface	No interface	No interface
	Distance Settled After 10 min	mm	Pin floc remains suspended.		Pin floc remains suspended. More cloudy on 3 and 4	
	Distance Settled After 20 min	mm	Pin floc right through all four jars			
	Distance Settled After 30min	mm				
	Settled depth	mm				
	Supernatant Testing	Supernatant pH	pH	7.87	7.53	5.9
	Supernatant UVT	%	94.4	94.6	84.7	83.6
	Supernatant Turbidity	NTU	4.96	3.74	21.24	24.81

	Test		8			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		19-08-24	19-08-24	19-08-24	19-08-24
	Time		14:30	14:30	14:30	14:30
In House Dissolved Metals	Aluminium	mg/L		0.08		
	Cobalt	mg/L		0.076		
	Iron	mg/L		0.364		
	Magnesium	mg/L				
	Manganese High range	mg/L		2.2		
Other Parameters	Nickel	mg/L		0.197		
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Flocs falling during slow mix. Tested supernatant on the 20/08/24 pH cal			
			Very cold day, sample water 13.8 degrees			
pH during fast mix (Neutralent added)	pH After 1 min		4.05	4.15	4.12	4.2
	pH After 2 min					
	pH After 3 min					
	pH After 5 min		4.45	4.41	4.35	4.34
	pH After 10 min		4.6	4.59	4.47	4.47
	pH After 15 min		4.91	4.81	4.52	4.5
	pH After 20 min		5.26	5.18	4.62	4.6
	pH After 21 min					
	pH After 25 min		5.6	5.62	4.74	4.71
pH during slow mix	pH After 1 min					
	pH After 5 min		5.61	5.54	4.84	4.85
	pH After 10 min		5.82	5.81	5.05	4.9

	Test	9				
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time		9:40	9:40	9:40	9:40
	Raw Water pH	pH	2.42	2.42	2.42	2.42
	Raw Water UVT	%	-0.20	-0.20	-0.20	-0.20
	Raw Water Turbidity	NTU	1.33	1.33	1.33	1.33
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	6	5.2	4.6	3.8
	Neutralent Dose	mg/L	1200	1040	920	760
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH	10.11	9.34	6.91	5.19
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	3	4	3	4
	Coag dose	mg/L	3	4	3	4
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	2.5	2	2.5
	Floc/Poly dose	mg/L	2	2.5	2	2.5
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculation Stage	pH after rapid mix	pH				
	Floc after rapid mix	A-G				
	Slow Mix Speed	rpm				
	Slow Mix Time	min				
	pH after slow mix	pH				
	Floc after slow mix	A-G				
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm				
	Distance Settled After 5 min	mm				
	Distance Settled After 10 min	mm				
	Distance Settled After 20 min	mm				
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

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	Test		10			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time		11:10	11:10	11:10	11:10
	Raw Water pH	pH	2.28	2.28	2.28	2.28
	Raw Water UVT	%	-0.20	-0.20	-0.20	-0.20
	Raw Water Turbidity	NTU	1.33	1.33	1.33	1.33
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	5	5	4	4
	Neutralent Dose	mg/L	1000	1000	800	800
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	3	4	3	4
	Coag dose	mg/L	3	4	3	4
	Rapid Mix Speed	rpm	350	350	350	350
Flocculant Addition	Rapid Mix Time	min	0.5	0.5	0.5	0.5
	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	2.5	2	2.5
	Floc/Poly dose	mg/L	2	2.5	2	2.5
	Rapid Mix Speed	rpm	350	350	350	350
Flocculation Stage	Rapid Mix Time	min	0.5	0.5	0.5	0.5
	pH after rapid mix	pH				
	Floc after rapid mix	A-G	B	B-C	B-C	B-C
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G	B-C	B-C	B-C	C-D
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	15	15	15	15
	Distance Settled After 5 min	mm	160	170	210	210
	Distance Settled After 10 min	mm	218	220	252	248
	Distance Settled After 20 min	mm	245	250	272	265
	Distance Settled After 30min	mm	258	255	278	270
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		10			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time		11:10	11:10	11:10	11:10
In House Dissolved Metals	Aluminium	mg/L			1.01	0.093
	Cobalt	mg/L			0.679/0.554	0.678
	Iron	mg/L			0.004	-0.002
	Magnesium	mg/L				
	Manganese High range	mg/L			26.4	27.9 OR
Other Parameters	Nickel	mg/L			0.498/0.480	0.472
	Hardness	mg/L				
	Alkalinity	mg/L			84.9	82.5
	CaCo3 (Alkalinity)	mg/L			986/954	990
	Mg 2+ (Alkalinity)	mg/L			225	231
	Ca 2+ (Alkalinity)	mg/L			23.8	16
	Notes		Fluffy floc in every jar. Floc 1 min slow: C	Floc 1 min slow: C	Floc 1 min slow: C	Floc 1 min slow: D-E fluffy and dense
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	4.73	4.99	4.54	4.64
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	7.1	7.02	4.69	4.83
	pH After 10 min	pH	8.02	8.36	5.11	4.52
	pH After 15 min	pH	8.7	8.87	5.16	5.65
	pH After 20 min	pH	8.81	9.12	5.66	6.03
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH	8.87	9.11	6.49	6.64
	pH After 5 min	pH	8.88	8.89	6	6.67
	pH After 10 min	pH	8.87	9.16	6.27	6.39

	Test		11			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
Sediment amount	Sample		S23	S23	S23	S23
			0.3g/L	3g/L	0.3g/L	3g/L
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time					
	Raw Water pH	pH	2.28	2.28	2.28	2.28
	Raw Water UVT	%	-0.20	-0.20	-0.20	-0.20
	Raw Water Turbidity	NTU	1.33	1.33	1.33	1.33
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	4	4	4.5	4.5
	Neutralent Dose	mg/L	800	800	900	900
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2.5	3	2.5	3
	Coag dose	mg/L	2.5	3	2.5	3
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	2.5	2	2.5
	Floc/Poly dose	mg/L	2	2.5	2	2.5
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	0.5	0.5	0.5	0.5
Flocculation Stage	pH after rapid mix	pH				
	Floc after rapid mix	A-G	C	C	C	C
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G	C-D	C-D	C-D	C-D
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	50	50	50	50
	Distance Settled After 5 min	mm	215	220	190	205
	Distance Settled After 10 min	mm	243	245	225	240
	Distance Settled After 20 min	mm	261	260	247	260
	Distance Settled After 30min	mm	270	267	258	270
	Settled depth	mm				
	Supernatant Testing					
	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		11			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time					
In House Dissolved Metals	Aluminium	mg/L	0.162	0.177	0.078	0.22
	Cobalt	mg/L	0.235	0.379	0.462	0.557
	Iron	mg/L	0.012	0.003	-0.007	-0.006
	Magnesium	mg/L				
	Manganese High range	mg/L	12.8	27.6 OR		
Other Parameters	Nickel	mg/L	0.39	0.432	0.145	0.119
	Hardness	mg/L				
	Alkalinity	mg/L	91.6	93.4	105	106
	CaCo3 (Alkalinity)	mg/L	974	988	1005	1000
	Mg 2+ (Alkalinity)	mg/L	229	229	232	235
	Ca 2+ (Alkalinity)	mg/L	13	18.4	13.9	14.5
	Notes		Fluffy floc in settling cylinder			
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	4.36	4.41	5.02	5.42
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	4.75	4.72	5.85	5.86
	pH After 10 min	pH	5.12	5.11	6.14	6.49
	pH After 15 min	pH	5.71	5.65	6.97	7.05
	pH After 20 min	pH	5.73	5.66	6.81	7.29
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH	6.09	6	6.71	7.08
	pH After 5 min	pH	6.39	6.44	7.32	7.35
	pH After 10 min	pH	6.32	6.18	6.79	7.13

	Test		12			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time		15:15	15:15	15:15	15:15
	Raw Water pH	pH				
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
	Jar - 1 litre					
Neutralent Addition	Chem added/Mgo/CaO etc		MgO	MgO	MgO	MgO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	5	8	12	15
	Neutralent Dose	mg/L	1000	1600	2400	3000
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
	Adjusted pH	pH				
Coagulant /Chelant	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2.5			
	Coag dose	mg/L	2.5	0	0	0
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	2	2	2
	Floc/Poly dose	mg/L	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
	pH after rapid mix	pH				
Flocculation Stage	Floc after rapid mix	A-G	D	D	D	D
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G	Floc had all settled for all four jars			
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	312	312	312	215
	Distance Settled After 5 min	mm	313	312	315	315
	Distance Settled After 10 min	mm	Bulk not dropping	Bulk not dropping	Bulk not dropping	Bulk not dropping
	Distance Settled After 20 min	mm				
	Distance Settled After 30min	mm				
	Settled depth	mm				
	Supernatant pH	pH				
Supernatant Testing	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		12			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			No sediment	No sediment	No sediment	No sediment
	Date		21-08-24	21-08-24	21-08-24	21-08-24
	Time		15:15	15:15	15:15	15:15
In House Dissolved Metals	Aluminium	mg/L			0.212	0.92
	Cobalt	mg/L			0.037	0.007
	Iron	mg/L			-0.004	0.003
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L			0.229	0.04
	Hardness	mg/L				
	Alkalinity	mg/L			98.3	111
	CaCo3 (Alkalinity)	mg/L			886	890
	Mg 2+ (Alkalinity)	mg/L			212	213
	Ca 2+ (Alkalinity)	mg/L			5.76	5.42
	Notes		Instant drop of floc. pin floc through all cylinders during settling. Jar 1 much cloudier than the others	Instant drop of floc. pin floc through all cylinders during settling.	Instant drop of floc. pin floc through all cylinders during settling.	Instant drop of floc. pin floc through all cylinders during settling.
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	3.8	4.11	4.27	4.92
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	4.16	4.29	4.65	5.65
	pH After 10 min	pH	4.18	4.41	5.77	7.25
	pH After 15 min	pH	4.27	5.03	6.37	8.17
	pH After 20 min	pH	4.24	5.04	6.58	8.22
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH	4.38	5.25	6.15	7.21
	pH After 5 min	pH	4.4	6.27	7.17	7.36
	pH After 10 min	pH	4.35	5.48	6.5	7.43

	Test		13			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		23-08-24	23-08-24	23-08-24	23-08-24
	Time		9:50	9:50	9:50	9:50
	Raw Water pH	pH	2.25	2.2	2.17	2.18
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
	Jar - 1 litre					
Neutralent Addition	Chem added/Mgo/CaO etc		MgO	MgO	MgO	MgO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	12	12	12	12
	Neutralent Dose	mg/L	2400	2400	2400	2400
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2	2.5	2	2.5
	Coag dose	mg/L	2	2.5	2	2.5
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1.5	1.5	1.5	1.5
	Floc/Poly dose	mg/L	1.5	1.5	1.5	1.5
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
	pH after rapid mix	pH				
Flocculation Stage	Floc after rapid mix	A-G	C-D	C-D	C-D	C-D
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH	7.89	7.81	7.78	7.91
	Floc after slow mix	A-G	Settled to bottom of all jars			
Settling	Settling Cylinder/Jar					
Stage	Distance Settled After 1 min	mm	308	308	308	310
	Distance Settled After 5 min	mm	308	308	308	310
	Distance Settled After 10 min	mm	308	308	308	310
	Distance Settled After 20 min	mm				
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH	7.43	7.48	7.41	7.36
	Supernatant UVT	%	92.9	92.3	92.6	92.4
	Supernatant Turbidity	NTU	1.28	1.6	1.78	1.24

	Test		13			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	S23	S23
Sediment amount			0.3g/L	3g/L	0.3g/L	3g/L
	Date		23-08-24	23-08-24	23-08-24	23-08-24
	Time		9:50	9:50	9:50	9:50
In House Dissolved Metals	Aluminium	mg/L	0.309			0.388
	Cobalt	mg/L	0.037			0.03
	Iron	mg/L	-0.005			-0.007
	Magnesium	mg/L				
	Manganese High range	mg/L	5.5			4.9
Other Parameters	Nickel	mg/L	0.178			0.148
	Hardness	mg/L	851			855
	Alkalinity	mg/L	93.8			90.7
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		All jars settled quickly but small floc as per photos after 2 min well settled			
pH during fast mix (Neutralent added)						
	pH After 1 min	pH				
	pH After 2 min	pH				
	pH After 3 min	pH	4	4	4.15	4.18
	pH After 5 min	pH	4.37	4.48	4.6	4.7
	pH After 10 min	pH	5.8	5.75	5.72	5.71
	pH After 15 min	pH	6.23	6.34	6.47	6.44
	pH After 20 min	pH	7.31	7.35	7.3	7.25
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH	7.74	7.63	7.9	7.58
	pH After 5 min	pH	7.81	7.75	7.9	7.77
	pH After 10 min	pH	7.89	7.81	7.78	7.91

	Test		14			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	Manchester	Manchester
Sediment amount			0.3g/L	0.3g/L	0.3g/L	0.3g/L
	Date		26-08-24	26-08-24	26-08-24	26-08-24
	Time					
	Raw Water pH	pH	2.49	2.48	3.08	3.08
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
	Jar - 1 litre					
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	4.5	4.5	1.3	1.3
	Neutralent Dose	mg/L	900	900	260	260
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
	Adjusted pH	pH				
Coagulant /Chelant	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	2.5	2.5	2	2
	Coag dose	mg/L	2.5	2.5	2	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G	C	C	G	G
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	2	1	1
	Floc/Poly dose	mg/L	2	2	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
	pH after rapid mix	pH				
Flocculation Stage	Floc after rapid mix	A-G				
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G				
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	70	70	(No interface) 30	30 (Very fluffy)
	Distance Settled After 5 min	mm	200	200	270	265 (Fluffy)
	Distance Settled After 10 min	mm	235	235	280	280 (Clearing)
	Distance Settled After 20 min	mm	255	255	285	288
	Distance Settled After 30min	mm	265	265	290 (Fluffy margin)	290 (Fluffy margin)
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		14			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		S23	S23	Manchester	Manchester
Sediment amount			0.3g/L	0.3g/L	0.3g/L	0.3g/L
	Date		26-08-24	26-08-24	26-08-24	26-08-24
	Time					
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Denser floc but still ~ ~ 200ml out of 1000ml	Denser floc but still ~ ~ 200ml out of 1000ml	Floc/sludge ~ ~ 100 ml	Floc/sludge ~ ~ 100 ml
			These tests are replicates for hills (test 1&2 are Sample 1)		These tests are replicates for hills (test 3&4 are Sample 2)	
pH during fast mix (Neutralent added)	pH After 1 min	pH				
	pH After 2 min	pH	4.57	4.59	5.9	5.69
	pH After 3 min	pH				
	pH After 5 min	pH	6.16	6.12	6.59	6.52
	pH After 10 min	pH	6.18	6.09	6.62	6.95
	pH After 15 min	pH	6.7	6.68	6.89	7.39
	pH After 20 min	pH	7.29	7.41	7.79	8.1
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix	pH After 1 min	pH	7.56	7.48	7.66	7.98
	pH After 5 min	pH	7.6	7.6	7.65	8.1
	pH After 10 min	pH	7.71	7.71	8.3	8.27

	Test	15			
	Description	Jar 1 (S1)	Jar 2 (S1)	Jar 3 (S2)	Jar 4 (S2)
Sediment amount	Sample	BVE	BVE	BVE	BVE
		3g/L	3g/L	3g/L	3g/L
	Date	27-08-24	27-08-24	27-08-24	27-08-24
	Time	11:45	11:45	11:45	11:45
	Raw Water pH	3.04	3.04	3.04	3.04
Neutralent Addition	Raw Water UVT	%	71.60	71.60	71.60
	Raw Water Turbidity	NTU	25.7	25.7	25.7
	Jar - 1 litre				
	Chem added/Mgo/CaO etc	CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20
Coagulant /Chelant	Slurry amount	mL	0.5	0.4	0.4
	Neutralent Dose	mg/L	100	80	80
	Rapid Mix Speed	rpm	350	350	350
	Rapid Mix Time	min	20	20	20
	Adjusted pH	pH			
Flocculant Addition	Coagulation/Chelation chem	Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%
	Coag amount	mL	1	1	1
	Coag dose	mg/L	1	1	1
	Rapid Mix Speed	rpm	350	350	350
Flocculation Stage	Rapid Mix Time	min	1	1	1
	Floc after rapid mix	A-G	C	G	G
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	1	1
Settling Stage	Floc/Poly dose	mg/L	2	1	1
	Rapid Mix Speed	rpm	350	350	350
	Rapid Mix Time	min	1	1	1
	pH after rapid mix	pH			
	Floc after rapid mix	A-G	B-C	D-F	D-F
Supernatant Testing	Slow Mix Speed	rpm	30	30	30
	Slow Mix Time	min	10	10	10
	pH after slow mix	pH			
	Floc after slow mix	A-G	Almost all settled in all four jars		
	Settling Cylinder/Jar				
Supernatant Testing	Distance Settled After 1 min	mm	319	315	315
	Distance Settled After 5 min	mm	No interface but most settled in 1 min to light floc in jar		
	Distance Settled After 10 min	mm			
	Distance Settled After 20 min	mm			
	Distance Settled After 30min	mm			
Supernatant Testing	Settled depth	mm	20	20	20
	Supernatant pH	pH			
	Supernatant UVT	%			
	Supernatant Turbidity	NTU			

	Test		15			
	Description		Jar 1 (S1)	Jar 2 (S1)	Jar 3 (S2)	Jar 4 (S2)
	Sample		BVE	BVE	BVE	BVE
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		27-08-24	27-08-24	27-08-24	27-08-24
	Time		11:45	11:45	11:45	11:45
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes					
					Added 0.1mLextra CaO at 5 mins	Added 0.1mLextra CaO at 5 mins
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	7.02	7.9	4.2	4.28
	pH After 2 min	pH				
	pH After 3 min	pH			5.02	4.91
	pH After 5 min	pH	9.08	8.76	6.9	6.7
	pH After 10 min	pH	9.31	9.08	8.13	8.32
	pH After 15 min	pH	9.45	9.55	8.21	8.52
	pH After 20 min	pH	9.56	9.4	8.68	8.71
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH	9.9	9.81	8.85	8.97
	pH After 10 min	pH	9.87	9.53	8.81	8.93

	Test	16			
	Description	Jar 1	Jar 2	Jar 3	Jar 4
Sediment amount	Sample	BVE	BVE	BVE	BVE
		3g/L	3g/L	3g/L	3g/L
	Date	27-08-24	27-08-24	27-08-24	27-08-24
	Time				
Neutralent Addition	Raw Water pH	pH	3	3	3
	Raw Water UVT	%			
	Raw Water Turbidity	NTU			
	Jar - 1 litre				
	Chem added/Mgo/CaO etc	MgO	MgO	MgO	MgO
	Concentration of slurry	%	20	20	20
	Slurry amount	mL	1	1	1.2
	Neutralent Dose	mg/L	200	200	240
Coagulant /Chelant	Rapid Mix Speed	rpm	350	350	350
	Rapid Mix Time	min	25	25	25
	Adjusted pH	pH			
	Coagulation/Chelation chem	Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%
	Coag amount	mL	1	1	1
	Coag dose	mg/L	1	1	1
	Rapid Mix Speed	rpm	350	350	350
Flocculant Addition	Rapid Mix Time	min	1	1	1
	Floc after rapid mix	A-G	C	C	G
	Flocculant/Polymer		Rheomax	Rheomax	Rheomax
	Floc/Poly Conc	%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	2	2	1
	Floc/Poly dose	mg/L	2	2	1
	Rapid Mix Speed	rpm	350	350	350
	Rapid Mix Time	min	1	1	1
Flocculation Stage	pH after rapid mix	pH	Milky/cloudy	Milky/cloudy	Milky/cloudy
	Floc after rapid mix	A-G	pin	pin	pin
	Slow Mix Speed	rpm	30	30	30
	Slow Mix Time	min	10	10	10
	pH after slow mix	pH			
	Floc after slow mix	A-G			
Settling Stage	Settling Cylinder/Jar				
	Distance Settled After 1 min	mm			
	Distance Settled After 5 min	mm			
	Distance Settled After 10 min	mm			
	Distance Settled After 20 min	mm			
	Distance Settled After 30min	mm			
	Settled depth	mm			
	Supernatant pH	pH			
Supernatant Testing	Supernatant UVT	%			
	Supernatant Turbidity	NTU			

	Test		16			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		BVE	BVE	BVE	BVE
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		27-08-24	27-08-24	27-08-24	27-08-24
	Time					
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes					
			Added 0.1mL MgO into each jar at 20 mins	Added 0.1mL MgO into each jar at 20 mins	Added 0.1mL MgO into each jar at 20 mins	Added 0.1mL MgO into each jar at 20 mins
pH during fast mix (Neutralent added)	pH After 1 min	pH	3.55	3.62	3.97	4.1
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	4.56	4.42	4.55	4.41
	pH After 10 min	pH	4.68	4.74	5.22	5.3
	pH After 15 min	pH	5.16	5.35	5.54	5.64
	pH After 20 min	pH	5.7	5.65	5.85	5.87
	pH After 21 min	pH	6.12	6.12	6.2	6.54
	pH After 25 min	pH	7.3	7.5	7.42	7.3
pH during slow mix	pH After 1 min	pH	7.7	7.45	7.9	7.91
	pH After 5 min	pH	7.85	7.99	8.04	8.1
	pH After 10 min	pH	8.01	8.1	8.14	8.21

	Test		17			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		03-09-24	03-09-24	03-09-24	03-09-24
	Time					
	Raw Water pH	pH	3.04	3.04	3.04	3.04
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
	Jar - 1 litre					
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.3	1.3	1.3	1.3
	Neutralent Dose	mg/L	260	260	260	260
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
	Adjusted pH	pH				
Coagulant /Chelant	Coagulation/Chelation chem		Superfloc	Superfloc	Superfloc	Superfloc
	Coag Conc	%	1.0%	1.0%	1.0%	1.0%
	Coag amount	mL	1	1.5	2	2.5
	Coag dose	mg/L	10	15	20	25
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G	G+	B	B	D
	Flocculant/Polymer		Crystalfloc	Crystalfloc	Crystalfloc	Crystalfloc
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	1
	Floc/Poly dose	mg/L	1	1	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
	pH after rapid mix	pH				
Flocculation Stage	Floc after rapid mix	A-G	G+	B	B	D
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G				
Settling Stage	Settling Cylinder/Jar		Jar. Settled well	Jar. Settled well but fluffy	Jar. Settled well but fluffy	Jar. Settled well but fluffy
	Distance Settled After 1 min	mm	Down to 90mm in 1-5 mins for all four jars			
	Distance Settled After 5 min	mm				
	Distance Settled After 10 min	mm				
	Distance Settled After 20 min	mm				
	Distance Settled After 30min	mm				
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		17			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		03-09-24	03-09-24	03-09-24	03-09-24
	Time					
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes					
pH during fast mix (Neutralent added)	pH After 1 min	pH	4.6	4.63	4.73	7.83
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	6.63	6.46	6.5	6.59
	pH After 10 min	pH	7.45	7.25	7.29	7.35
	pH After 15 min	pH	7.96	7.87	7.86	7.8
	pH After 20 min	pH	8.28	8.22	8.2	8.14
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix	pH After 1 min	pH				
	pH After 5 min	pH	8.5	8.41	8.26	8.25
	pH After 10 min	pH	8.35	8.18	8.21	8.14

	Test		18			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		03-09-24	03-09-24	03-09-24	03-09-24
	Time					
	Raw Water pH	pH				
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
Neutralent Addition	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	1.3	1.3	1.3	1.3
	Neutralent Dose	mg/L	260	260	260	260
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
Coagulant /Chelant	Adjusted pH	pH				
	Coagulation/Chelation chem		Superfloc	Superfloc	Superfloc	Superfloc
	Coag Conc	%	1.0%	1.0%	1.0%	1.0%
	Coag amount	mL	2	5	9	12
	Coag dose	mg/L	20	50	90	120
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculant Addition	Floc after rapid mix	A-G				
	Flocculant/Polymer		Crystalfloc	Crystalfloc	Crystalfloc	Crystalfloc
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	1
	Floc/Poly dose	mg/L	1	1	1	1
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculation Stage	pH after rapid mix	pH				
	Floc after rapid mix	A-G	C	B	B	B
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
	Floc after slow mix	A-G	G+	G+	G+	G+
Settling Stage	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm				
	Distance Settled After 5 min	mm	250 Fluffy	240 Fluffy	235 Fluffy	220 Fluffy
	Distance Settled After 10 min	mm	270 Fluffy	270 Fluffy	270 Fluffy	270 Fluffy
	Distance Settled After 20 min	mm	283	285	285	285
	Distance Settled After 30min	mm	290	290	296	296
	Settled depth	mm				
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		18			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		Manchester	Manchester	Manchester	Manchester
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		03-09-24	03-09-24	03-09-24	03-09-24
	Time					
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
Notes						
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	4.71	4.69	4.79	4.8
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	5.95	5.8	5.99	5.96
	pH After 10 min	pH	6.6	6.45	6.6	6.56
	pH After 15 min	pH	6.98	6.94	6.89	6.85
	pH After 20 min	pH	7.18	7.2	7.15	7.2
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH	7.45	7.53	7.55	7.49
	pH After 10 min	pH	7.65	7.62	7.58	7.54

	Test		19			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
Sediment amount	Sample		BVE	BVE	S23	S23
			3g/L	3g/L	3g/L	3g/L
	Date		03-09-24	03-09-24	03-09-24	03-09-24
	Time					
Neutralent Addition	Raw Water pH	pH	3.08	3.12	2.46	2.46
	Raw Water UVT	%				
	Raw Water Turbidity	NTU				
	Jar - 1 litre					
	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20
	Slurry amount	mL	0.35	0.35	4.5	4.5
Coagulant /Chelant	Neutralent Dose	mg/L	70	70	900	900
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	20	20	20	20
	Adjusted pH	pH				
Flocculant Addition	Coagulation/Chelation chem		Superfloc	Superfloc	Superfloc	Superfloc
	Coag Conc	%	1.0%	1.0%	1.0%	1.0%
	Coag amount	mL	0.5	1	3	3
	Coag dose	mg/L	5	10	30	30
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Flocculation Stage	Floc after rapid mix	A-G				G
	Flocculant/Polymer		Crystalfloc	Crystalfloc	Crystalfloc	Crystalfloc
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	1	1	1	2
	Floc/Poly dose	mg/L	1	1	1	2
	Rapid Mix Speed	rpm	350	350	350	350
	Rapid Mix Time	min	1	1	1	1
Settling Stage	pH after rapid mix	pH				
	Floc after rapid mix	A-G	C	B	G+	G+
	Slow Mix Speed	rpm	30	30	30	30
	Slow Mix Time	min	10	10	10	10
	pH after slow mix	pH				
Supernatant Testing	Floc after slow mix	A-G	D	E-F	G+	F-G
	Settling Cylinder/Jar					
	Distance Settled After 1 min	mm	Settled	Floating	Settled	Settled
	Distance Settled After 5 min	mm	Settled	Pin floc		
	Distance Settled After 10 min	mm	Fully settled	Most settled, still pin flocs		
	Distance Settled After 20 min	mm				
	Distance Settled After 30min	mm				
	Settled depth	mm			85mm settled by 5 mins	
Supernatant Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				

	Test		19			
	Description		Jar 1	Jar 2	Jar 3	Jar 4
	Sample		BVE	BVE	S23	S23
Sediment amount			3g/L	3g/L	3g/L	3g/L
	Date		03-09-24	03-09-24	03-09-24	03-09-24
	Time					
In House Dissolved Metals	Aluminium	mg/L				
	Cobalt	mg/L				
	Iron	mg/L				
	Magnesium	mg/L				
	Manganese High range	mg/L				
Other Parameters	Nickel	mg/L				
	Hardness	mg/L				
	Alkalinity	mg/L				
	CaCo3 (Alkalinity)	mg/L				
	Mg 2+ (Alkalinity)	mg/L				
	Ca 2+ (Alkalinity)	mg/L				
	Notes		Best BVE settling & floc for column		Best S23, less floc	
						Added 4 drops CaO at 10 mins rapid mix
pH during fast mix (Neutralent added)						
	pH After 1 min	pH	4.69	4.87	4.45	4.37
	pH After 2 min	pH				
	pH After 3 min	pH				
	pH After 5 min	pH	5.82	6	5.47	4.87
	pH After 10 min	pH	6.19	6.49	6.26	5.21
	pH After 15 min	pH	6.31	6.8	6.6	6.41
	pH After 20 min	pH	7.01	7.32	7.04	6.79
	pH After 21 min	pH				
	pH After 25 min	pH				
pH during slow mix						
	pH After 1 min	pH				
	pH After 5 min	pH	7.06	7.06	6.81	6.75
	pH After 10 min	pH	6.95	7.22		

APPENDIX D – SUPERNATANT TREATED WATER LABORATORY RESULTS

Sample Type: Aqueous

Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Hardness	g/m ³ as CaCO ₃	640	2,300	630	2,200	200
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Hardness	g/m ³ as CaCO ₃	650	650	640	630	640
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Hardness	g/m ³ as CaCO ₃	2,200	2,200	196	197	620
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Hardness	g/m ³ as CaCO ₃	630	2,100	2,200	210	210
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments

Sample 20 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces report '3668046-SPv1' issued on 17-Sep-2024 at 2:08 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Jun-2025. 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.

pt in full, without the written consent of the signatory.

APPENDIX E – NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE

AR-24-NW-046418-01

REPORT DATE

05/08/2024

SAMPLE CODE812-2024-00109651

Sample Name

Makareao Oxide 13-17/7

Sample Reference

Makareao Oxide

Reception Date & Time:

02/08/2024 9:30

Analysis Started on:

03/08/2024

Product Type

Quicklime

Sampler(s)

CUSTOMER

Analysis Ending Date:

05/08/2024

Sampled Date & Time

30/07/2024 00:00

RESULTS		LOQ	
NW499	Arsenic - Total		
	Arsenic (As)	0.34	mg/kg0.05
NW504	Cadmium - Total		
	Cadmium (Cd)	0.64	mg/kg0.01
NW507	Chromium - Total		
	Chromium (Cr)	8.8	mg/kg0.2
NW509	Copper - Total		
	Copper (Cu)	1.3	mg/kg0.3
NW511	Lead - Total		
	Lead (Pb)	0.5	mg/kg0.1
NW515	Mercury - Total		
	Mercury (Hg)	<0.1	mg/kg0.1
NW517	Nickel - Total		
	Nickel (Ni)	1.2	mg/kg0.2

LIST OF METHODS

NW499

Arsenic - Total: APHA Online Edition 3125 B mod.

NW504

Cadmium - Total: APHA Online Edition 3125 B mod.

NW507

Chromium - Total: APHA Online Edition 3125 B mod.

NW509

Copper - Total: APHA Online Edition 3125 B mod.

NW511

Lead - Total: APHA Online Edition 3125 B mod.

NW515

Mercury - Total: APHA Online Edition 3125 B mod.

NW517

Nickel - Total: APHA Online Edition 3125 B mod.

Signature



Food & Water Testing

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received. Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

This document can only be reproduced in full.

The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT



SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
Restriction of Use in NZ: Refer to Section 15

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

Product Name: **High Calcium Quicklime**

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5.	Fire Fighting Measures
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Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6.	Accidental Release Measures
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Personal precautions:

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WESSTEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: MAGNESIUM OXIDE 87%

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.
Product Code: 1065 (Bulk) *These sieves correspond approximately to those of the metric series.

Active Water Treatment Testing Report

Appendix B – Supernatant Quality Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	25/03/2026
Document Number:	PFL-2408-PRO-RPT-00003

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated following Client Review			G Smith	25/03/2026

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1 AMD TREATED SUPERNATANT TESTING

1.1 Summary

For this second body of testing work reported here, AMD water treatment has been performed at three different process simulation scales 1 litre Jars, 56l Columns and 175l Barrels. The proposed treatment process will generate supernatant water (clean treated water) which will be discharged to further polishing and discharge.

Supernatant has been produced from the simulated WTP settling process for various testing work performed on sludge handling and characterisation, High Density Sludge Treatment and Magnesium Oxide Testing. This supernatant has been compared to previous testing for repeatability.

In general, the testing using CaO, Metalsorb and Rheomax showed that supernatant water quality that shows good metals removal was possible at all scales of testing (1 litre (Jar Tests), 56 litre (Column Tests) and 175 litre (Barrel Tests)) and using the proposed treatment process. Metals removal of all metals in each test compared to proposed GVs was not achieved in all processes. Most tests had either aluminium or one or two other metals which did not meet the GVs.

Process optimisation and refinements are required to achieve metals removals to a level to meet the Modified Guideline Values for all metals and treatment targets of pH, TSS and Turbidity.

Jar tests – one test presented herein (T14S2 Manchester St) is compliant with modified Chronic Guideline Values for all metals except aluminium, however, the pH is above the treated target.

(For other jar test results see report **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0**).

For column tests with 24 hr settling– two complied with everything except aluminium, both with pH elevated above the Treated Target, and one of these had elevated Total suspended solids above Treated target. Another complied with all metals modified GVs except cobalt, and total suspended solids Treated target.

Column tests with 30 min settling– two complied with everything except aluminium GV, pH and TSS Treated targets. One complied with all metals GVs except Cobalt at the 90% and 95% Level of Protection (LoP).

For the Barrel tests (at 175 litres scale) the S23 Raw Water Barrel Test 10 complied with all Modified Guideline Values, however it did not comply with Turbidity pH and TSS treated targets. All other Barrel Tests complied with all parameters except for aluminium GV, pH and TSS treated targets.

The High-Density Sludge (HDS) process did not provide supernatants that fully complied. There was one result which complied with all parameters except aluminium GV, pH and TSS treated targets. Two results complied with all metals GVs except aluminium, and cobalt GVs and pH treated target. One result complied with all GVs except aluminium and cobalt. One result complied with everything except for cobalt and manganese GVs.

The makeup water test complied with all metals GVs except for aluminium and cobalt, and pH and TSS treated targets.

The MgO testing results with 24-hour settling showed some compliance with metals GVs, with three of the MgO tests that fully complied with all metals GVs but did not comply with pH and Turbidity treated targets. One set of results did not comply with Nickel 95% LoP and pH and Turbidity treated targets were not met.

For the Sludge thickening supernatants, two test results complied with the Modified Guideline Values for metals but didn't meet the treated targets for pH. One test met the metals GVs but didn't meet the treated target for pH and Turbidity. (Total suspended solids was not measured for in the thickening supernatants). The quality of these supernatants indicates that there could be a process option to add this supernatant to the discharge directly, rather than recycling back to the influent AMD, if the TSS was acceptable.

For the Mixing trial supernatant results, mixing Waimangaroa River water and Barrel Manchester T2 water, 3 results complied. The Barrel Manchester T2 to Waimangaroa Test Ratio 0.5:1 complied with all metals GVs and all treated targets for pH, Turbidity and TSS.

The test mix of the 1:1 ratio complied with all metals GVs, but not the TSS treated target. The test mix 2:1 ratio complied with all metals GVs but not Turbidity and TSS treated targets. The test mixes 0.01:1 and the 0.1:1 mix ratios complied with all metals GVs except Aluminium at the 95% LoP and one at the 90% LoP. Treatment targets for pH, Turbidity and TSS were met for these samples.

Note that after these tests, and because of the insufficient removal of some metals, particularly residual aluminium, further testing was trialled using processes to remove aluminium. The full treatment process plus the additional aluminium removal process were further trialled in final confirmation testing new raw water sampled of the three water types – Manchester St, Barren Valley Elf and S23. This is documented in detail in **PFL-2408-PRO-RPT-00014 - Appendix M - Confirmation Tests_Rev0**.

1.2 Supernatant from various Treatment Processes

The water quality of the supernatant from these tests has been compared to the water quality achieved in the initial AMD treatment testing reported in the previous treatment report **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0**, covering bench and column scale testing and is presented in the section below.

The following supernatant has been produced using the method of treatment as per the previous treatment report **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0**.

The process involved the following:

- Neutralisation Lime Dosing (CaO), rapid mixing and neutralising residence time
- Metal Chelating Agent/Coagulant Dosing, rapid mixing and residence time
- Flocculant Dosing and rapid mixing and residence time
- Floc formation, slow mixing and residence time
- Settling process, settling time and velocity of settled interface
- Treated Water Polishing Pond/Sump, simulated as next day settling results

In the previous report the following chemicals and reagents were found to be the best combination for treatment of the Mean quality Raw Water (Manchester St).

- CaO – Dosed at 260g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1-1.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Flocculation time 10 minutes
- Settling Time 20-30 minutes

These doses and parameters were used to repeat testing on Manchester St AMD for the following further testing work:

- Column Sludge testing – primarily to gain information on sludge, but supernatant was collected and tested to give repeatability of results.
- Barrel Bulk AMD Treatment - primarily to create bulk sludge for thickening and dewatering testing, but supernatant was collected and tested again to ensure repeatability and compliance.
- High Density Sludge (HDS) Testing – this was an alternative treatment method, which produced treated supernatant as well as a recycled sludge component. This process used the same coagulant and flocculant dosing as per above, but the CaO varied due to the nature of the sludge being recycled.
- Magnesium Oxide as a neutralant was trialled again to investigate potential for improved slaking, neutralisation and settling. Similar doses of MgO and coagulant and flocculant and mixing times and speeds as in **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0** were used and supernatant tested.

The results presented in Tables 1 to 14 below are a summary of supernatant qualities achieved across all the PFL testing carried out. For a summary of results and comparison with compliance targets refer to PFL-2408-PRO-RPT-00001 – Summary of Testing.

- Table 1 – Test parameters for column scale testing carried out in October 2024
- Table 2 – Analysed results for column scale testing carried out in October 2024
- Table 3 – Test parameters for bench and column scale testing carried out in August 2024
- Table 4 – Analysed results for bench and column scale testing carried out in August 2024
- Table 5 – Test parameters for barrel scale testing carried out in January 2025
- Table 6 – Analysed results for barrel scale testing carried out in January 2025
- Table 7 – Test parameters for HDS testing carried out in March 2025
- Table 8 – Analysed results for HDS testing carried out in March 2025
- Table 9 - Test parameters for MGO testing carried out in December 2024
- Table 10 - Analysed results for MGO testing carried out in December 2024
- Table 11 – Test parameters for sludge thickening testing carried out in August 2024
- Table 12 – Analysed results for sludge thickening testing carried out in August 2024
- Table 13 – Test parameters for mixing trial testing carried out in April 2025
- Table 14 – Analysed results for mixing trial testing carried out in April 2025

1.3 Column Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 1 Column Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 24 hours Settling

PF Test Number Identifier and Date Sample Sent for Analysis		C1T1 P1500 29-Aug-2024 9:30 am	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am	T14 C3 P1 24H Super 18-Oct-2024 12:20 pm
Hills Lab Number:		3668046.6	3668046.1	3698774.5
Sample		Manchester st	Manchester st	Manchester st
Neutralent		CaO	CaO	CaO
Coagulant		Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax
Sediment added		None	3g/l	3g/l
Rapid Mix time (Neutralisation)	minutes	20	20	20
Rapid Mix time for coagulant addition	minutes	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1
Slow Mix Time	minutes	10	10	No slow mix, immediate settling
Settling Time	minutes	24 hours	24 hours	24 hours
Test Vessel Size		Settling Column 56 litres	Settling Column 56 litres	Settling Column 56 litres

Table 2 Column Supernatant Water Quality Results 24 hrs settling

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	C1T1 P1500 29-Aug-2024 9:30 am	C1T3 NEXTDAY P1 30- Aug-2024 11:20 am	T14 C3 P1 24H Super 18- Oct-2024 12:20 pm
Turbidity	NTU	19.8	0.53	0.51	0.76
Turbidity Target	NTU		5	5	5
pH	pH Units	3.2	7.6	7	8
pH Target	pH Units		4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	16.7	11.9	18.4
Total Hardness	g/m3 as CaCO3	270	650	640	620
Electrical Conductivity (EC)	mS/m	114.4			
Total Suspended Solids	g/m3	<70	6	6	5
TSS Target	g/m3		5	5	5
Dissolved Aluminium	g/m3	51	0.99	0.126	1.22
Dissolved Aluminium Chronic GV 95%	g/m3		0.51	0.31	0.36
Dissolved Aluminium Chronic GV 90%	g/m3		0.64	0.40	0.46
Dissolved Aluminium Chronic GV 80%	g/m3		0.87	0.54	0.62
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	220	220	210
Dissolved Chromium	g/m3	0.0051	< 0.0005	< 0.0005	0.001
Dissolved Cobalt	g/m3	0.094	0.0025	0.0094	0.0017
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	C1T1 P1500 29-Aug-2024 9:30 am	C1T3 NEXTDAY P1 30- Aug-2024 11:20 am	T14 C3 P1 24H Super 18- Oct-2024 12:20 pm
Dissolved Copper Chronic GV 95%	g/m3		0.0018	0.0013	0.0011
Dissolved Copper Chronic GV 90%	g/m3		0.0022	0.0015	0.0013
Dissolved Copper Chronic GV 80%	g/m3		0.0034	0.0024	0.0021
Dissolved Iron	g/m3	13.2	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	23	24	21
Dissolved Manganese	g/m3	1.99	0.49	0.92	0.33
Dissolved Manganese Chronic GV 95%	g/m3		1.24	1.23	1.22
Dissolved Manganese Chronic GV 90%	g/m3		1.90	1.89	1.87
Dissolved Manganese Chronic GV 80%	g/m3		3.11	3.09	3.05
Dissolved Nickel	g/m3	0.23	0.012	0.039	0.0076
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	< 0.0010	0.01	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.076	0.102	0.042
Dissolved Zinc Chronic GV 90%	g/m3		0.114	0.153	0.062
Dissolved Zinc Chronic GV 80%	g/m3		0.196	0.263	0.107
Dissolved Organic Carbon (DOC)	g/m3		1.8	1.1	0.9
Absorbance at 254 nm	AU cm-1	0.518	0.009	0.014	0.012
Transmittance at 254 nm	%T, 1 cm cell	30.3	97.9	96.9	97.2
Iron + Manganese		15.19	0.51	0.94	0.35
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.24	2.23	2.22

1.4 Column and Bench Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 3 Column and Bench Scale Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 mins settling

PF Test Number Identifier and Date Sample Sent for Analysis		T16 C1 P1 Super 18- Oct-2024 12:30 pm	C1T1 30MIN P1 28- Aug-2024	C1T3-30MIN-P1 29- Aug-2024 1:04 pm	T14S2-MAN 26-Aug- 2024 4:00 pm
Hills Lab Number:		3698774.6	3668046.7	3668046.9	3668046.3
Sample		Manchester st	Manchester st	Manchester st	Manchester st
Neutralent		CaO	CaO	CaO	CaO
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax	Rheomax
Sediment added		3g/l	3g/l	3g/l	0.3g/l
Rapid Mix time (Neutralisation)	minutes	20	20	20	20
Rapid Mix time for coagulant addition	minutes	1	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1	1
Slow Mix Time	minutes	No slow mix, immediate settling	10	10	10
Settling Time	minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Settling Column 56 litres	Settling Column 56 litres	Settling Column 56 litres	Bench Jar 1 Litre

Table 4 Column and Bench Scale Supernatant Water Quality Results 30 mins settling

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	T16 C1 P1 Super 18-Oct-2024 12:30 pm	C1T1 30MIN P1 28-Aug-2024	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	1.29	1.2	1.26	0.86
Turbidity Target	NTU		5	5	5	5
pH	pH Units	3.2	8.2	7.5	7	7.7
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	19.4	17.2	12.2	14.7
Total Hardness	g/m3 as CaCO3	270	610	650	630	630
Electrical Conductivity (EC)	mS/m	114.4				
Total Suspended Solids	g/m3	<70	6	7	5	5
TSS Target	g/m3		5	5	5	5
Dissolved Aluminium	g/m3	51	1.1	0.79	0.13	0.93
Dissolved Aluminium Chronic GV 95%	g/m3		0.43	0.44	0.37	0.48
Dissolved Aluminium Chronic GV 90%	g/m3		0.55	0.56	0.46	0.61
Dissolved Aluminium Chronic GV 80%	g/m3		0.75	0.76	0.63	0.83
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	210	220	220	220
Dissolved Chromium	g/m3	0.0051	0.001	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m3	0.094	0.0023	0.0025	0.0095	0.0026
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	T16 C1 P1 Super 18- Oct-2024 12:30 pm	C1T1 30MIN P1 28- Aug-2024	C1T3-30MIN-P1 29- Aug-2024 1:04 pm	T14S2-MAN 26-Aug- 2024 4:00 pm
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0013	0.0016	0.0015	0.0016
Dissolved Copper Chronic GV 90%	g/m3		0.0015	0.0019	0.0018	0.0020
Dissolved Copper Chronic GV 80%	g/m3		0.0024	0.0030	0.0029	0.0032
Dissolved Iron	g/m3	13.2	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1.0
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	21	23	23	22
Dissolved Manganese	g/m3	1.99	0.37	0.49	0.91	0.49
Dissolved Manganese Chronic GV 95%	g/m3		1.21	1.24	1.22	1.22
Dissolved Manganese Chronic GV 90%	g/m3		1.86	1.90	1.88	1.88
Dissolved Manganese Chronic GV 80%	g/m3		3.03	3.11	3.07	3.07
Dissolved Nickel	g/m3	0.23	0.0105	0.0117	0.04	0.0115
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	< 0.0010	< 0.0010	0.0085	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.042	0.077	0.113	0.067
Dissolved Zinc Chronic GV 90%	g/m3		0.062	0.115	0.168	0.100
Dissolved Zinc Chronic GV 80%	g/m3		0.107	0.198	0.289	0.172
Dissolved Organic Carbon (DOC)	g/m3		1.1	1.5	1.4	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.008	0.008	0.009	0.013
Transmittance at 254 nm	%T, 1 cm cell	30.3	98.1	98.3	98.1	97.1
Iron + Manganese		15.19	0.39	0.51	0.93	0.51
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.21	2.24	2.22	2.22

Sludge Creation Barrel Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 5 Sludge Creation Barrel Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan- 2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31- Jan-2025	For Comparison T14S2-MAN 26-Aug- 2024 4:00 pm
Hills Lab Number:		3839045.1	3839045.2	3839045.3	3839045.4	3839045.5	3668046.3
Sample		Manchester st	Manchester St New	Manchester St New	Manchester St New	New S23	Manchester st
Neutralent		CaO	CaO	CaO	CaO	CaO	CaO
Dose							1.3mg/l
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax	Rheomax	Rheomax	Rheomax
Sediment added		None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	minutes	20	20	20	20	20	20
Rapid Mix time for coagulant addition		1	1	1	1	1	1
Rapid Mix time for coagulant addition		1	1	1	1	1	1
Slow Mix Time	minutes	10	10	10	10	10	10
Settling Time		30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bench Jar 1 Litre

Table 6 Supernatant Water Quality Results Sludge Creation Barrel Tests

PF Test Identifier and Date Sent for Analysis		Manchester St OLD Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16 01 25	Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	16.8	1.08	3.2	2.1	1.23	1.59	12.8	0.86
Turbidity Target	NTU				5	5	5	5	5	5
pH	pH	3.2	3.1	2.6	8	7.9	10.9	9.7	7.4	7.7
pH Target	pH				4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3*	<1	< 1.0	< 1.0	17.8	14.8	102	48	15.5	14.7
Total Hardness	g/m3*	270	197	1,110	620	510	580	520	1930	630
EC	mS/m	114.4	103.7	381						
TSS	g/m3	<70	17	5	26	9	6	15	118	5
TSS Target	g/m3				5	5	5	5	5	58
Dissolved Aluminium	g/m3	51	46	220	1.5	1.67	14.9	7.7	0.096	0.93
Dissolved Aluminium Chronic GV 95%	g/m3				0.28	0.24	0.34	0.30	0.26	0.48
Dissolved Aluminium Chronic GV 90%	g/m3				0.35	0.30	0.43	0.38	0.33	0.61
Dissolved Aluminium Chronic GV 80%	g/m3				0.48	0.42	0.58	0.52	0.45	0.83
Dissolved Cadmium	g/m3	0.00081	0.00082	0.0037	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3				0.00037	0.00037	0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3				0.00069	0.00069	0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3				0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	53	199	230	183	230	210	600	220
Dissolved Chromium	g/m3	0.0051	0.0042	0.107	0.0013	0.0009	0.0013	0.0012	0.0041	< 0.0005
Dissolved Cobalt	g/m3	0.094	0.085	0.36	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002	0.0026
Dissolved Cobalt Chronic GV 95%	g/m3				0.0033	0.0033	0.0033	0.0033	0.0033	0.0033

PF Test Identifier and Date Sent for Analysis		Manchester St OLD Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16 01 25	Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Dissolved Cobalt Chronic GV 90%	g/m3				0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3				0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	0.0148	0.084	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3				0.0008	0.0007	0.0008	0.0007	0.0009	0.0016
Dissolved Copper Chronic GV 90%	g/m3				0.0010	0.0009	0.0010	0.0009	0.0011	0.0020
Dissolved Copper Chronic GV 80%	g/m3				0.0016	0.0014	0.0016	0.0014	0.0018	0.0032
Dissolved Iron	g/m3	13.2	3.5	170	0.02	0.02	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3				1.0	1.0	1.0	1.0	1.0	1.0
Dissolved Lead	g/m3	0.00136	0.00159	< 0.0010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	15.6	150	12.8	13.4	0.08	0.56	107	22
Dissolved Manganese	g/m3	1.99	1.41	11.6	0.0018	0.158	0.0005	0.0005	0.31	0.49
Dissolved Manganese Chronic GV 95%	g/m3				1.22	1.12	1.18	1.13	1.25	1.22
Dissolved Manganese Chronic GV 90%	g/m3				1.87	1.72	1.82	1.74	1.93	1.88
Dissolved Manganese Chronic GV 80%	g/m3				3.05	2.81	2.97	2.84	3.15	3.07
Dissolved Nickel	g/m3	0.23	0.2	1.02	< 0.0005	0.0032	< 0.0005	< 0.0005	0.0009	0.0115
Dissolved Nickel Chronic GV 95%	g/m3				0.099	0.099	0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3				0.118	0.118	0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3				0.154	0.154	0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	0.99	5.8	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

PF Test Identifier and Date Sent for Analysis		Manchester St OLD Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16 01 25	Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Dissolved Zinc Chronic GV 95%	g/m3				0.036	0.036	0.033	0.031	0.062	0.067
Dissolved Zinc Chronic GV 90%	g/m3				0.053	0.054	0.049	0.046	0.092	0.100
Dissolved Zinc Chronic GV 80%	g/m3				0.091	0.092	0.084	0.078	0.158	0.172
DOC	g/m3		0.8	1.1	0.6	< 0.5	0.6	< 0.5	0.7	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.109	6.31	0.006	0.013	0.004	0.015	0.014	0.013
Transmittance at 254 nm (1 cm cell)	%T,	30.3			98.5	97.1	99.1	96.6	96.8	97.1
Iron + Manganese		15.19	4.91	181.6	0.0218	0.178	0.0205	0.0205	0.33	0.51
Dissolved Iron + Manganese Chronic GV 80%/90%/95%					2.22	2.12	2.18	2.13	2.25	2.22

*as CaCO₃

1.5 HDS and Makeup Water Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 7 HDS and Makeup Water Tests - Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14- Mar-2025 4:00 pm	HDS Test 20 Supernatant 21-Mar- 2025	Makeup T1 J1 J2 27- Mar-2025 2:15 pm
Hills Lab Number:		3839045.6	3841393.19	3841393.2	3841393.21	3839045.7	3839045.8
Sample		Manchester st	Manchester st	Manchester st	Manchester st	Manchester st	Manchester st
Neutralent		CaO	CaO	CaO	CaO	CaO	CaO
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax	Rheomax	Rheomax	Rheomax
Sediment added		None	None	None	None	None	None
Rapid Mix time (Neutralisation)	minutes	20	20	20	20	20	20
Rapid Mix time for coagulant addition	minutes	1	1	1	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1	1	1	1
Slow Mix Time	minutes	10	10	10	10	10	10
Settling Time	minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre

Table 8 Supernatant Water Quality Results HDS and Makeup Water Tests

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	HDS Test 1 Supernatant 26-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Turbidity	NTU	19.8	2.1	0.16	0.12	0.08	0.56	3.3
Turbidity Target	NTU		5	5	5	5	5	5
pH	pH Units	3.2	8.7	7.1	6.9	6.9	8	7.7
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	23	10.7	9.1	8.4	15	13.4
Total Hardness	g/m3 as CaCO3	270	640	650	640	640	660	630
Electrical Conductivity (EC)	mS/m	114.4						
Total Suspended Solids	g/m3	<70	14	4	< 3	< 3	4	7
TSS Target	g/m3		5	5	5	5	5	5
Dissolved Aluminium	g/m3	51	3.8	0.76	0.158	0.24	1.26	0.94
Dissolved Aluminium Chronic GV 95%	g/m3		0.30	0.22	0.18	0.18	0.31	0.23
Dissolved Aluminium Chronic GV 90%	g/m3		0.38	0.28	0.23	0.23	0.39	0.29
Dissolved Aluminium Chronic GV 80%	g/m3		0.52	0.38	0.32	0.32	0.53	0.39
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	230	220	210	220	230	220
Dissolved Chromium	g/m3	0.0051	0.0012	0.0008	0.0007	0.0007	0.0008	0.0008

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	HDS Test 1 Supernatant 26- Feb-2025	HDS Test 6 - Supernatant 28- Feb-2025 11:45 am	HDS Test 12 - Supernatant 14- Mar-2025 9:30 am	HDS Test 15 - Supernatant 14- Mar-2025 4:00 pm	HDS Test 20 Supernatant 21- Mar-2025	Makeup T1 J1 J2 27-Mar- 2025 2:15 pm
Dissolved Cobalt	g/m3	0.094	< 0.0002	0.0035	0.0197	0.0179	0.0052	0.0044
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0007	0.0008	0.0007	0.0007	0.0009	0.0007
Dissolved Copper Chronic GV 90%	g/m3		0.0009	0.0010	0.0009	0.0009	0.0011	0.0009
Dissolved Copper Chronic GV 80%	g/m3		0.0014	0.0016	0.0014	0.0014	0.0018	0.0014
Dissolved Iron	g/m3	13.2	0.02	0.02	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1	1	1
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	17.1	25	26	24	22	21
Dissolved Manganese	g/m3	1.99	0.035	0.59	1.37	1.13	0.51	0.58
Dissolved Manganese Chronic GV 95%	g/m3		1.23	1.24	1.23	1.23	1.25	1.22
Dissolved Manganese Chronic GV 90%	g/m3		1.89	1.90	1.89	1.89	1.92	1.88
Dissolved Manganese Chronic GV 80%	g/m3		3.09	3.11	3.09	3.09	3.13	3.07
Dissolved Nickel	g/m3	0.23	< 0.0005	0.0121	0.058	0.053	0.0149	0.0189
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154	0.154	0.154

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	HDS Test 1 Supernatant 26- Feb-2025	HDS Test 6 - Supernatant 28- Feb-2025 11:45 am	HDS Test 12 - Supernatant 14- Mar-2025 9:30 am	HDS Test 15 - Supernatant 14- Mar-2025 4:00 pm	HDS Test 20 Supernatant 21- Mar-2025	Makeup T1 J1 J2 27-Mar- 2025 2:15 pm
Dissolved Zinc	g/m3	1.11	< 0.0010	0.0032	0.0125	0.0078	0.0011	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.031	0.074	0.081	0.081	0.038	0.042
Dissolved Zinc Chronic GV 90%	g/m3		0.046	0.111	0.121	0.121	0.057	0.063
Dissolved Zinc Chronic GV 80%	g/m3		0.078	0.190	0.208	0.208	0.097	0.109
Dissolved Organic Carbon (DOC)	g/m3		< 0.5	0.6	< 0.5	< 0.5	0.7	0.5
Absorbance at 254 nm	AU cm- 1	0.518	0.007	0.015	0.039	0.005	0.008	0.008
Transmittance at 254 nm	%T, 1 cm cell	30.3	98.5	96.5	91.3	98.8	98.2	98.1
Iron + Manganese		15.19	0.055	0.61	1.39	1.15	0.53	0.6
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.23	2.24	2.23	2.23	2.25	2.22

1.6 MgO Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 9 MgO Test 2 - 13/12/25 Process Parameters for Neutralisation, Coagulation, Flocculation and 24 hours Settling

PF Test Number Identifier and Date Sample Sent for Analysis		MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Hills Lab Number:		3841393.1	3841393.2	3841393.3	3841393.4
Sample		Manchester St	Manchester St	Manchester St	Manchester St
Neutralent		Farmguard MgO 10% Slurry Slaked at 20°C	Farmguard MgO 10% Slurry Slaked at 55°C	EMAG45 MgO 10% Slurry Slaked at 20°C	EMAG MgO 10% Slurry Slaked at 65°C
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax 1050	Rheomax 1050	Rheomax 1050	Rheomax 1050
Sediment added		None	None	None	None
Rapid Mix time (Neutralisation)	minutes	30	30	30	30
Rapid Mix time for coagulant addition	minutes	1	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1	1
Slow Mix Time	minutes	10	10	10	10
Settling Time	minutes	24 hours	24 hours	24 hours	24 hours
Test Vessel Size		1 litre	1 litre	1 litre	1 litre

Table 10 Supernatant Water Quality from MgO Test 2 - 13/12/24 Neutralisation, Coagulation, Flocculation and 24 hours Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
In house PF testing - pH at end of Rapid Mix			9.4	9.39	9.18	9.27
Turbidity	NTU	19.8	33	38	6.6	12.3
Turbidity Target	NTU		5	5	5	5
pH	pH Units	3.2	8.9	9.4	8.4	8.8
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	24	24	13	16
Total Hardness	g/m3 as CaCO3	270	650	660	650	650
Electrical Conductivity (EC)	mS/m	114.4				
Total Suspended Solids	g/m3	<70	-	-	-	-
TSS Target	g/m3		5	5	5	5
Dissolved Aluminium	g/m3	51	0.075	0.091	0.034	0.03
Dissolved Aluminium Chronic GV 95%	g/m3		0.50	0.44	0.34	0.47
Dissolved Aluminium Chronic GV 90%	g/m3		0.63	0.55	0.43	0.59
Dissolved Aluminium Chronic GV 80%	g/m3		0.86	0.75	0.59	0.81
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	72	74	71	70
Dissolved Chromium	g/m3	0.0051	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m3	0.094	0.0013	0.0009	0.0168	0.0075
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0013	0.0011	0.0009	0.0012
Dissolved Copper Chronic GV 90%	g/m3		0.0015	0.0013	0.0011	0.0014
Dissolved Copper Chronic GV 80%	g/m3		0.0024	0.0021	0.0018	0.0023
Dissolved Iron	g/m3	13.2	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	115	115	114	115
Dissolved Manganese	g/m3	1.99	0.09	0.036	1.13	0.65
Dissolved Manganese Chronic GV 95%	g/m3		1.24	1.25	1.24	1.24
Dissolved Manganese Chronic GV 90%	g/m3		1.90	1.92	1.90	1.90
Dissolved Manganese Chronic GV 80%	g/m3		3.11	3.13	3.11	3.11
Dissolved Nickel	g/m3	0.23	0.0188	0.0152	0.1	0.066
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	< 0.0010	0.0012	0.0033	0.0023
Dissolved Zinc Chronic GV 95%	g/m3		0.042	0.039	0.035	0.040
Dissolved Zinc Chronic GV 90%	g/m3		0.062	0.058	0.052	0.060
Dissolved Zinc Chronic GV 80%	g/m3		0.107	0.099	0.090	0.103
Dissolved Organic Carbon (DOC)	g/m3		1.1	0.9	0.7	1
Absorbance at 254 nm	AU cm-1	0.518	0.008	0.007	0.005	0.008
Transmittance at 254 nm	%T, 1 cm cell	30.3	98.1	98.4	98.8	98.3
Iron + Manganese		15.19	0.11	0.056	1.15	0.67

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	MgO Test 2 Farm 20 13-Dec- 2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.24	2.25	2.24	2.24

1.7 Sludge Thickening Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 11 Sludge Thickening Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel MAN Test 2 Supernatant 30- Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb- 2025	THICKEN T6J4 S23 Supernatant 12- Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12- Feb-2025	For Comparison T14S2-MAN 26- Aug-2024 4:00 pm
Hills Lab Number:		3839045.2	3839045.5	3841393.15	3841393.16	3841393.17	3841393.18	3668046.3
Sample		Manchester St New	New S23	Sludge fromT2/T6 Mix Manchester New	Sludge fromT2/T6 Mix Manchester New	Sludge from T10 S23 New	Sludge from T10 S23 New	Manchester st
Neutralent		CaO	CaO	None	None	None	None	CaO
Coagulant		Metalsorb	Metalsorb	None	None	None	None	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax1050 15mg/l	Crystalfloc610H 15mg/l	Rheomax1030 35mg/l	Crystalfloc610H 15mg/l	Rheomax
Sediment added		None	None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	mins	20	20	None	None	None	None	20
Rapid Mix time for coagulant addition	mins	1	1	None	None	None	None	1
Rapid Mix time for flocculant addition	mins	1	1	1	1	5 seconds	5 seconds	1
Slow Mix Time	mins	10	10	10	10	30 seconds	30 seconds	10
Settling Time		30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	Bulk Barrel 175 litres	1 litre	1 litre	1 litre	1 litre	Bench Jar 1 Litre

Table 12 Supernatant Water Quality Results Sludge Thickening Tests

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16.01.25	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	16.8	1.08	2.1	12.8	4.9	8.8	-	1.33	0.86
Turbidity Target	NTU				5	5	5	5	5	5	5
pH	pH	3.2	3.1	2.6	7.9	7.4	8	8.5	-	7.3	7.7
pH Target	pH				4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Alkalinity ##	g/m3	<1	< 1.0	< 1.0	14.8	15.5	14.5	20	-	15.7	14.7
Hardness ##	g/m3	270	197	1,110	510	1930	560	540	1,930	1,930	630
EC*	mS/m	114.4	103.7	381							
TSS***	g/m3	<70	17	5	9	118	-	-	-	-	5
TSS Target	g/m3				5	5	5	5	5	5	5
Aluminium #	g/m3	51	46	220	1.67	0.096	0.054	0.35	0.083	0.006	0.93
Aluminium Chronic GV 95%	g/m3				0.24	0.26	0.50	2.37	-	0.38	0.48
Aluminium Chronic GV 90%	g/m3				0.30	0.33	0.64	2.99	-	0.48	0.61
Aluminium Chronic GV 80%	g/m3				0.42	0.45	0.87	4.08	-	0.65	0.83
Cadmium #	g/m3	0.00081	0.00082	0.0037	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Cadmium Chronic GV 95%	g/m3				0.00037	0.00037	0.00037	0.00037	0.00037	0.00037	0.00037
Cadmium Chronic GV 90%	g/m3				0.00069	0.00069	0.00069	0.00069	0.00069	0.00069	0.00069

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16.01.25	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Cadmium Chronic GV 80%	g/m3				0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Calcium #	g/m3	69	53	199	183	600	210	200	620	620	220
Chromium #	g/m3	0.0051	0.0042	0.107	0.0009	0.0041	0.0014	0.0018	0.0057	0.0059	< 0.0005
Cobalt #	g/m3	0.094	0.085	0.36	0.0007	< 0.0002	0.0002	< 0.0002	0.0015	0.0012	0.0026
Cobalt Chronic GV 95%	g/m3				0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
Cobalt Chronic GV 90%	g/m3				0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Cobalt Chronic GV 80%	g/m3				0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Copper #	g/m3	0.0133	0.0148	0.084	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005
Copper Chronic GV 95%	g/m3				0.0007	0.0009	0.0016	0.0079	-	0.0014	0.0016
Copper Chronic GV 90%	g/m3				0.0009	0.0011	0.0019	0.0096	-	0.0017	0.0020
Copper Chronic GV 80%	g/m3				0.0014	0.0018	0.0030	0.0151	-	0.0027	0.0032
Iron #	g/m3	13.2	3.5	170	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Iron Chronic GV 80%/90%/95%	g/m3				1	1	1	1	1	1	1.0
Lead #	g/m3	0.00136	0.00159	< 0.0010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Magnesium #	g/m3	24	15.6	150	13.4	107	8.4	8	93	94	22
Manganese #	g/m3	1.99	1.41	11.6	0.158	0.31	0.0054	0.0043	0.31	0.33	0.49
Manganese Chronic GV 95%	g/m3				1.12	1.25	1.17	1.15	1.25	1.25	1.22

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16.01.25	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Manganese Chronic GV 90%	g/m3				1.72	1.93	1.79	1.76	1.93	1.93	1.88
Manganese Chronic GV 80%	g/m3				2.81	3.15	2.92	2.88	3.15	3.15	3.07
Nickel #	g/m3	0.23	0.2	1.02	0.0032	0.0009	0.0008	0.0006	0.0016	0.0022	0.0115
Nickel Chronic GV 95%	g/m3				0.099	0.099	0.099	0.099	0.099	0.099	0.099
Nickel Chronic GV 90%	g/m3				0.118	0.118	0.118	0.118	0.118	0.118	0.118
Nickel Chronic GV 80%	g/m3				0.154	0.154	0.154	0.154	0.154	0.154	0.154
Zinc #	g/m3	1.11	0.99	5.8	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0014	0.0068	< 0.0010
Zinc Chronic GV 95%	g/m3				0.036	0.062	0.051	0.118	-	0.086	0.067
Zinc Chronic GV 90%	g/m3				0.054	0.092	0.077	0.177	-	0.128	0.100
Zinc Chronic GV 80%	g/m3				0.092	0.158	0.132	0.303	-	0.220	0.172
DOC	g/m3		0.8	1.1	< 0.5	0.7	1.5	15	-	1.3	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.109	6.31	0.013	0.014	0.007	0.01	-	0.019	0.013
Transmittance at 254 nm	%T, 1 cm cell	30.3			97.1	96.8	98.3	97.6	-	95.8	97.1
Iron + Mn #		15.19	4.91	181.6	0.178	0.33	0.0254	0.0243	0.33	0.35	0.51
Iron + Mn Chronic GV 80%/90%/95%					2.12	2.25	2.17	2.15	2.25	2.25	2.22

Dissolved Metals

*DOC – Dissolved Organic Carbon

**EC Electrical Conductivity

##Total, as CaCO3 ***TSS

1.8 Mixing Trial April 2025 – Waimangaroa with Supernatant -Water Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 13 Mixing Trials April 2025 - Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel MAN Test 2 Supernatant 30- Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr- 2025 2:00 pm	Mix Trial Man 2 - 0.1 : 1 16-Apr- 2025 2:00 pm	Mix Trial Man 2 - 0.5 : 1 16-Apr- 2025 2:00 pm	Mix Trial Man 2 - 1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 2 : 1 16-Apr-2025 2:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm
Hills Lab Number:		3839045.2	3862009.1	3862009.2	3862009.3	3862009.4	3862009.5	3668046.3
Sample		Manchester St New	Barrel Man T2 - 0.01 : 1 Waimangaroa	Barrel Man T2 0.1 : 1 Waimangaroa	Barrel Man T2 0.5 : 1 Waimangaroa	Barrel Man T2 1 : 1 Waimangaroa	Barrel Man T2 2 : 1 Waimangaroa	Manchester st
Neutralent		CaO	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO
Coagulant		Metalsorb	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb
Flocculant		Rheomax	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax
Sediment added		None	None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	minutes	20	None	None	None	None	None	20
Rapid Mix time for coagulant addition	minutes	1	None	None	None	None	None	1
Rapid Mix time for flocculant addition	minutes	1	None	None	None	None	None	1
Slow Mix Time	minutes	10	Invert 3-4 times	Invert 3-4 times	Invert 3-4 times	Invert 3-4 times	Invert 3-4 times	10
Settling Time		30 minutes	None	None	None	None	None	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	5L Bottle	5L Bottle	5L Bottle	5L Bottle	5L Bottle	Bench Jar 1 Litre

Table 14 Supernatant Water Quality Results – April 2025 Mixing Trials – Supernatant with Waimangaroa River Water

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 01 25	Waimangaroa Raw	Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025	Mix Trial Man 2 – 0.1 : 1 16-Apr-2025	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025	Mix Trial Man 2 – 1 : 1 16-Apr-2025	Mix Trial Man 2 – 2 : 1 16-Apr-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	16.8	1.7	2.1	0.97	1.36	2	1.43	5.2	0.86
Turbidity Target	NTU				5	5	5	5	5	5	5
pH	pH	3.2	3.1	6.5	7.9	6.5	6.5	6.9	6.9	7	7.7
pH Target	pH				4.5-7	4.5-4	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Alkalinity ##	g/m3	<1	< 1.0	4	14.8	3.9	4.1	6.4	7.3	8.8	14.7
Hardness ##	g/m3	270	197	11	510	15.8	59	190	280	360	630
EC*	mS/m	114.4	103.7								
TSS***	g/m3	<70	17	< 3	9	< 3	< 3	4	8	9	5
TSS	g/m3				5	5	5	5	5	5	5
Aluminium #	g/m3	51	46	0.23	1.67	0.23	0.27	0.32	0.083	0.177	0.93
Al Chronic GV 95%	g/m3				0.24	0.15	0.26	0.36	0.25	0.20	0.48
Al Chronic GV 90%	g/m3				0.30	0.20	0.32	0.46	0.32	0.26	0.61
Al Chronic GV 80%	g/m3				0.42	0.27	0.44	0.63	0.44	0.35	0.83
Cadmium #	g/m3	0.00081	0.00082	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Cd Chronic GV 95%	g/m3				0.00037	0.00004 ****	0.00010	0.00027	0.00037	0.00037	0.00037
Cd Chronic GV 90%	g/m3				0.00069	0.00007	0.00019	0.00050	0.00069	0.00069	0.00069
Cd Chronic GV 80%	g/m3				0.00155	0.00015	0.00042	0.00112	0.00155	0.00155	0.00155
Calcium #	g/m3	69	53	2.6	183	4.4	19.9	67	101	129	220
Chromium #	g/m3	0.0051	0.0042	< 0.0005	0.0009	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0007	< 0.0005
Cobalt #	g/m3	0.094	0.085	0.0011	0.0007	0.0011	0.0011	0.0009	0.0009	0.0008	0.0026

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 01 25	Waimangaroa Raw	Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025	Mix Trial Man 2 - 1 : 1 16-Apr-2025	Mix Trial Man 2 - 2 : 1 16-Apr-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Co Chronic GV 95%	g/m3				0.0033	0.0014	0.0015	0.0024	0.0029	0.0032	0.0033
Co Chronic GV 90%	g/m3				0.0078	0.0033	0.0035	0.0057	0.0067	0.0075	0.0078
Co Chronic GV 80%	g/m3				0.0208	0.0090	0.0094	0.0153	0.0180	0.0200	0.0208
Copper #	g/m3	0.0133	0.0148	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cu Chronic GV 95%					0.0007	0.0030	0.0029	0.0020	0.0012	0.0008	0.0016
Cu Chronic GV 90%					0.0009	0.0036	0.0035	0.0024	0.0014	0.0010	0.0020
Cu Chronic GV 80%					0.0014	0.0057	0.0055	0.0038	0.0023	0.0016	0.0032
Iron #	g/m3	13.2	3.5	0.09	0.02	0.09	0.08	0.04	0.02	0.02	0.02
Fe Chronic GV 80% /90%/95%	g/m3				1	1	1	1	1	1	1.0
Lead #	g/m3	0.00136	0.00159	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Magnesium #	g/m3	24	15.6	1.08	13.4	1.14	2.3	5.5	7.8	9.7	22
Manganese #	g/m3	1.99	1.41	0.04	0.158	0.042	0.053	0.083	0.107	0.121	0.49
Manganese Chronic GV 95%	g/m3				1.12	0.32	0.46	0.75	0.88	0.97	1.22
Manganese Chronic GV 90%	g/m3				1.72	0.50	0.71	1.15	1.35	1.49	1.88
Manganese Chronic GV 80%	g/m3				2.81	0.81	1.16	1.88	2.20	2.44	3.07
Nickel #	g/m3	0.23	0.2	0.0019	0.0032	0.0018	0.002	0.0022	0.0019	0.0019	0.0115
Nickel Chronic GV 95%	g/m3				0.099	0.011	0.020	0.053	0.073	0.091	0.099

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 01 25	Waimangaroa Raw	Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025	Mix Trial Man 2 - 1 : 1 16-Apr-2025	Mix Trial Man 2 - 2 : 1 16-Apr-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Nickel Chronic GV 90%	g/m3				0.118	0.013	0.023	0.062	0.087	0.107	0.118
Nickel Chronic GV 80%	g/m3				0.154	0.017	0.030	0.082	0.113	0.141	0.154
Zinc #	g/m3	1.11	0.99	0.0083	< 0.0010	0.0078	0.0069	0.0049	0.0026	< 0.0010	< 0.0010
Zinc Chronic GV 95%	g/m3				0.036	0.012	0.040	0.071	0.077	0.073	0.067
Zinc Chronic GV 90%	g/m3				0.054	0.018	0.060	0.106	0.114	0.109	0.100
Zinc Chronic GV 80%	g/m3				0.092	0.030	0.102	0.183	0.196	0.187	0.172
DOC	g/m3		0.8	3.7	< 0.5	3.7	3.5	2.1	1	0.6	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.109	0.142	0.013	0.142	0.12	0.077	0.026	0.015	0.013
Transmittance at 254 nm	%T, 1 cm cell	30.3		72	97.1	72.1	75.8	83.8	94.2	96.7	97.1
Iron + Mn #		15.19	4.91	0.13	0.178	0.132	0.133	0.123	0.127	0.141	0.51
Iron + Mn Chronic GV 80%/90%/95%					2.12	1.32	1.46	1.75	1.88	1.97	2.22
Thallium #	g/m3			0.00007	-	0.00007	0.0002	0.0005	0.00071	0.00092	-
Sulphate	g/m3			6.6	-	11.3	50	172	250	340	-
Potassium #	g/m3			0.43	-	0.5	1.12	2.9	4.5	5.5	-
Sodium #	g/m3			2.9	-	3	3.2	3.1	3.5	3.5	-
Acidity (pH 5.5)	g/m3 CaCO3			< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-
Acidity (pH 7.0)	g/m3 CaCO3			2	-	2	1.5	1.5	1	< 1.0	-
Total Acidity (pH 8.3)	g/m3 CaCO3			6	-	4	6	4.5	4	6.5	-

Dissolved Metals

*DOC – Dissolved Organic Carbon

**EC Electrical Conductivity

##Total, as CaCO₃

***TSS

**** Cd - indicates that GV is less than the trace LOQ

APPENDIX A –WATER QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3668046-SP-2

3685490-SP-1

3698774-SP-1

3839044-SP-1

3839045-SP-1

3841393-SP-2

3862009-SP-1

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

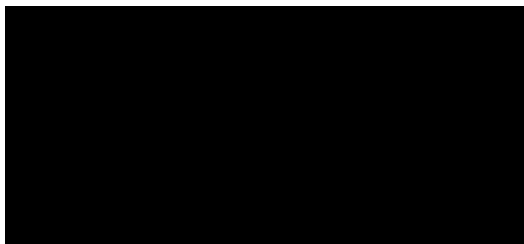
Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

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Sample Type: Aqueous						
Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039



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Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments						
Sample 20 Comment: Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).						

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

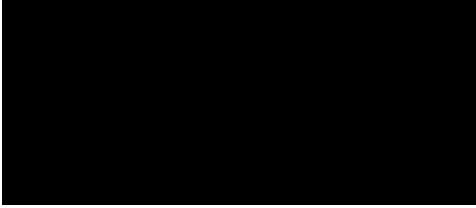
Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Sep-2024. 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.

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Sample Type: Aqueous			
Sample Name:		T8C2 P1500 05-Sep-2024 12:00 pm	S23 Raw 29-Jul-2024 2:40 pm
Lab Number:		3685490.1	3685490.2
pH	pH Units	6.9	2.6
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.1	1,160
Acidity (pH 7.0)	g/m ³ as CaCO ₃	< 1.1	1,260
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	2.1	1,410
Total Alkalinity	g/m ³ as CaCO ₃	8.5	< 1.0
Free Carbon Dioxide	g/m ³ at 25°C	2.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	2,500	850
Dissolved Calcium	g/m ³	820 #1	170 #1
Total Calcium	g/m ³	700 #1	165 #1
Dissolved Magnesium	g/m ³	100	102
Total Sodium	g/m ³	5.1	-
Chloride	g/m ³	13.5	-
Nitrite-N	g/m ³	< 0.002	< 0.002
Nitrate-N	g/m ³	0.117	0.103
Nitrate-N + Nitrite-N	g/m ³	0.117	0.105
Sulphate	g/m ³	3,100	3,300
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.2

Analyst's Comments

#1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

Sample 2 Comment:

It should be noted that the calculation used to determine the result for Free Carbon Dioxide is only valid when the pH of the sample is 4.5 or greater. APHA method 4500-CO₂ D states 'When the total alkalinity of a water is due almost entirely to hydroxides, carbonates, or bicarbonates, and the total dissolved solids is not greater than 500mg/L, the alkalinity forms and free CO₂ can be calculated from the sample pH and total alkalinity'. As alkalinity is usually defined as titration to pH 4.5 (M-alkalinity), any water sample with a pH or less than 4.5 will have no alkalinity, and the calculation used to determine Free Carbon Dioxide is unlikely to represent the true level of Carbon Dioxide in the sample.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2



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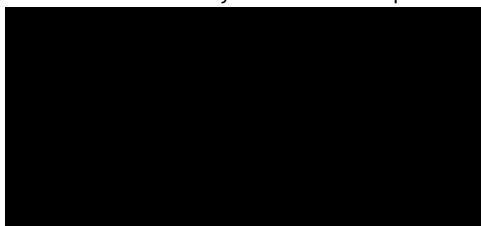
Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Acidity (pH 5.5)	Titration to pH 5.5 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Acidity (pH 7.0)	Titration to pH 7.0 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Free Carbon Dioxide	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D : Online Edition.	1.0 g/m ³ at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-2
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m ³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-2
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-2
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2

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

Testing was completed between 03-Oct-2024 and 17-Oct-2024. 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.

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Sample Type: Aqueous

Sample Name:		T10 C1 P1 30Min 15-Oct-2024 1:00 pm	T11 C2 P1 24H 17-Oct-2024 10:20 am	T12 C1 P1 30Min 16-Oct-2024 1:53 pm	T13 C1 P1 24H Supernatant 18-Oct-2024 10:15 am	T14 C3 P1 24H Super 18-Oct-2024 12:20 pm
Lab Number:		3698774.1	3698774.2	3698774.3	3698774.4	3698774.5
Turbidity	NTU	0.92	3.2	1.43	1.29	0.76
pH	pH Units	7.3	8.4	7.2	8.3	8.0
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Acidity (pH 7.0)	g/m ³ as CaCO ₃	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	3.9	2.0	2.1	2.1	2.1
Total Alkalinity	g/m ³ as CaCO ₃	11.2	22	10.3	20	18.4
Free Carbon Dioxide	g/m ³ at 25°C	1.1	< 1.0	1.4	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	1,950	1,960	1,950	1,940	620
Total Suspended Solids	g/m ³	17	13	8	8	5
Total Solids (TS)	g/m ³	3,300	3,300	3,300	3,300	990
Dissolved Aluminium	g/m ³	0.180	1.16	0.20	1.24	1.22
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00012	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	640	660	640	650	210
Dissolved Chromium	g/m ³	0.0031	0.0035	0.0031	0.0035	0.0010
Dissolved Cobalt	g/m ³	0.0022	< 0.0002	0.0112	< 0.0002	0.0017
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	84	78	88	76	21
Dissolved Manganese	g/m ³	1.07	0.41	2.2	0.40	0.33
Dissolved Nickel	g/m ³	0.0036	< 0.0005	0.035	< 0.0005	0.0076
Dissolved Zinc	g/m ³	0.0057	< 0.0010	0.0029	< 0.0010	< 0.0010
Chloride	g/m ³	5.8	5.7	12.9	13.0	4.6
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	0.114	0.113	0.116	0.112	0.004
Nitrate-N + Nitrite-N	g/m ³	0.114	0.113	0.116	0.113	0.004
Sulphate	g/m ³	2,800	3,000	3,300	3,100	760
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.1	0.9	0.9	0.9
Absorbance at 254 nm	AU cm ⁻¹	0.012	0.013	0.009	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	97.2	97.1	98.1	97.8	97.2

Sample Name:		T16 C1 P1 Super 18-Oct-2024 12:30 pm	T17 C1 P1 30Min 21-Oct-2024 10:43 am
Lab Number:		3698774.6	3698774.7
Turbidity	NTU	1.29	0.54
pH	pH Units	8.2	7.6
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.1	< 1.1
Acidity (pH 7.0)	g/m ³ as CaCO ₃	< 1.1	< 1.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	2.1	1.6



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous			
Sample Name:		T16 C1 P1 Super 18-Oct-2024 12:30 pm	T17 C1 P1 30Min 21-Oct-2024 10:43 am
Lab Number:		3698774.6	3698774.7
Total Alkalinity	g/m ³ as CaCO ₃	19.4	13.2
Free Carbon Dioxide	g/m ³ at 25°C	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	610	580
Total Suspended Solids	g/m ³	6	4
Total Solids (TS)	g/m ³	980	990
Dissolved Aluminium	g/m ³	1.10	0.62
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	199
Dissolved Chromium	g/m ³	0.0010	0.0010
Dissolved Cobalt	g/m ³	0.0023	0.0068
Dissolved Copper	g/m ³	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	21	21
Dissolved Manganese	g/m ³	0.37	0.65
Dissolved Nickel	g/m ³	0.0105	0.024
Dissolved Zinc	g/m ³	< 0.0010	0.0012
Chloride	g/m ³	3.6	6.0
Nitrite-N	g/m ³	< 0.002	< 0.002
Nitrate-N	g/m ³	< 0.002	0.002
Nitrate-N + Nitrite-N	g/m ³	0.002	0.002
Sulphate	g/m ³	770	780
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.008	0.010
Transmittance at 254 nm*	%T, 1 cm cell	98.1	97.6

Analyst's Comments

Sample 7 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-7
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-7
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-7
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Acidity (pH 5.5)	Titration to pH 5.5 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Acidity (pH 7.0)	Titration to pH 7.0 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7

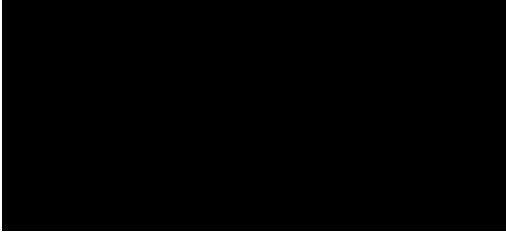
Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Free Carbon Dioxide	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D : Online Edition.	1.0 g/m ³ at 25°C	1-7
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-7
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-7
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-7
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-7
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-7
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-7
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-7
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-7
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-7
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-7
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-7
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-7
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-7
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-7
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-7
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-7
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-7
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-7

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

Testing was completed between 22-Oct-2024 and 31-Oct-2024. 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.

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Sample Type: Aqueous			
Sample Name:		S23 New Jan 25 16-Jan-2025	Manchester St New Raw Jan 25 30-Jan-2025
Lab Number:		3839044.1	3839044.2
Individual Tests			
True Hazen Colour	Hazen units	< 10	< 10
Turbidity	NTU	1.08	16.8
pH	pH Units	2.6	3.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	1,970	350
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	1,110	197
Electrical Conductivity (EC)	mS/m	381	103.7
Total Suspended Solids	g/m ³	5	17
Total Solids (TS)	g/m ³	4,400	770
Dissolved Aluminium	g/m ³	220	46
Dissolved Calcium	g/m ³	199	53
Dissolved Cobalt	g/m ³	0.36	0.085
Dissolved Iron	g/m ³	170	3.5
Dissolved Magnesium	g/m ³	150	15.6
Dissolved Manganese	g/m ³	11.6	1.41
Dissolved Mercury	g/m ³	< 0.002	< 0.002
Total Sodium	g/m ³	3.8	3.6
Chloride	g/m ³	5.4	3.6
Sulphate	g/m ³	3,100	540
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.8
Total Organic Carbon (TOC)	g/m ³	1.8	2.0
Absorbance at 254 nm	AU cm ⁻¹	6.31	0.109
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn			
Dissolved Arsenic	g/m ³	0.066	< 0.0010
Dissolved Cadmium	g/m ³	0.0037	0.00082
Dissolved Chromium	g/m ³	0.107	0.0042
Dissolved Copper	g/m ³	0.084	0.0148
Dissolved Lead	g/m ³	< 0.0010	0.00159
Dissolved Nickel	g/m ³	1.02	0.20
Dissolved Zinc	g/m ³	5.8	0.99



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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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m ³	1-2
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-2
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-2
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-2
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-2
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-2
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-2
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-2
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-2
Dissolved Mercury	Filtered sample, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.002 g/m ³	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2

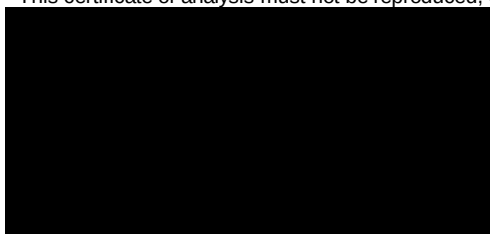
Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-2

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

Testing was completed between 01-Apr-2025 and 07-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:		Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 523 New Supernatant 31-Jan-2025
Lab Number:		3839045.1	3839045.2	3839045.3	3839045.4	3839045.5
Turbidity	NTU	3.2	2.1	1.23	1.59	12.8
pH	pH Units	8.0	7.9	10.9	9.7	7.4
Total Alkalinity	g/m ³ as CaCO ₃	17.8	14.8	102	48	15.5
Total Hardness	g/m ³ as CaCO ₃	620	510	580	520	1,930
Total Suspended Solids	g/m ³	26	9	6	15	118
Dissolved Aluminium	g/m ³	1.50	1.67	14.9	7.7	0.096
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	183	230	210	600
Dissolved Chromium	g/m ³	0.0013	0.0009	0.0013	0.0012	0.0041
Dissolved Cobalt	g/m ³	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	12.8	13.4	0.08	0.56	107
Dissolved Manganese	g/m ³	0.0018	0.158	< 0.0005	< 0.0005	0.31
Dissolved Nickel	g/m ³	< 0.0005	0.0032	< 0.0005	< 0.0005	0.0009
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Organic Carbon (DOC)	g/m ³	0.6	< 0.5	0.6	< 0.5	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.013	0.004	0.015	0.014
Transmittance at 254 nm*	%T, 1 cm cell	98.5	97.1	99.1	96.6	96.8

Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Turbidity	NTU	2.1	0.56	3.3
pH	pH Units	8.7	8.0	7.7
Total Alkalinity	g/m ³ as CaCO ₃	23	15.0	13.4
Total Hardness	g/m ³ as CaCO ₃	640	660	630
Total Suspended Solids	g/m ³	14	4	7
Dissolved Aluminium	g/m ³	3.8	1.26	0.94
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	230	220
Dissolved Chromium	g/m ³	0.0012	0.0008	0.0008
Dissolved Cobalt	g/m ³	< 0.0002	0.0052	0.0044
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	17.1	22	21



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Sample Type: Aqueous				
Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Dissolved Manganese	g/m³	0.035	0.51	0.58
Dissolved Nickel	g/m³	< 0.0005	0.0149	0.0189
Dissolved Zinc	g/m³	< 0.0010	0.0011	< 0.0010
Dissolved Organic Carbon (DOC)	g/m³	< 0.5	0.7	0.5
Absorbance at 254 nm	AU cm⁻¹	0.007	0.008	0.008
Transmittance at 254 nm*	%T, 1 cm cell	98.5	98.2	98.1

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-8
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-8
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-8
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-8
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-8
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-8
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-8
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-8
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-8
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-8
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-8
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-8
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-8
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-8

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

Testing was completed between 03-Apr-2025 and 11-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:		MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm	BVELF Bypass T1 J1J2 7.5 17-Mar-2025 3:00 pm
Lab Number:		3841393.1	3841393.2	3841393.3	3841393.4	3841393.5
Turbidity	NTU	33	38	6.6	12.3	3.6
pH	pH Units	8.9	9.4	8.4	8.8	7.4
Total Alkalinity	g/m ³ as CaCO ₃	24	24	13.0	16.0	14.6
Total Hardness	g/m ³ as CaCO ₃	650	660	650	650	200
Total Suspended Solids	g/m ³	-	-	-	-	33
Dissolved Aluminium	g/m ³	0.075	0.091	0.034	0.030	0.114
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00011
Dissolved Calcium	g/m ³	72	74	71	70	75
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0013	0.0009	0.0168	0.0075	0.024
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	115	115	114	115	3.5
Dissolved Manganese	g/m ³	0.090	0.036	1.13	0.65	0.37
Dissolved Nickel	g/m ³	0.0188	0.0152	0.100	0.066	0.048
Dissolved Zinc	g/m ³	< 0.0010	0.0012	0.0033	0.0023	0.033
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.9	0.7	1.0	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.008	0.007	0.005	0.008	0.036
Transmittance at 254 nm*	%T, 1 cm cell	98.1	98.4	98.8	98.3	92.1

Sample Name:		BVELF Bypass T1 J3J4 7.0 17-Mar-2025 3:00 pm	BVELF Bypass T3 J1J2 6.5 19-Mar-2025 12:00 pm	BVELF Bypass T3 J3J4 6.0 19-Mar-2025 12:00 pm	BVELF Bypass T2 J1J4 5.5 17-Mar-2025 4:00 pm	MAN Bypass T5 J1J2 7.5 19-Mar-2025 2:45 pm
Lab Number:		3841393.6	3841393.7	3841393.8	3841393.9	3841393.10
Turbidity	NTU	4.5	3.8	5.8	2.9	2.1
pH	pH Units	6.5	6.6	6.4	5.9	6.8
Total Alkalinity	g/m ³ as CaCO ₃	7.5	9.3	7.4	4.0	12.5
Total Hardness	g/m ³ as CaCO ₃	193	194	196	186	650
Total Suspended Solids	g/m ³	37	38	39	35	19
Dissolved Aluminium	g/m ³	0.025	0.023	0.018	0.097	0.062
Dissolved Cadmium	g/m ³	0.00029	0.00030	0.00032	0.00035	0.00017
Dissolved Calcium	g/m ³	71	72	72	69	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008
Dissolved Cobalt	g/m ³	0.044	0.044	0.046	0.047	0.024
Dissolved Copper	g/m ³	0.0009	0.0006	0.0008	0.0050	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	0.00014	< 0.00010	0.00019	0.00185	< 0.00010



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Sample Type: Aqueous						
Sample Name:		BVELF Bypass T1 J3J4 7.0 17-Mar-2025 3:00 pm	BVELF Bypass T3 J1J2 6.5 19-Mar-2025 12:00 pm	BVELF Bypass T3 J3J4 6.0 19-Mar-2025 12:00 pm	BVELF Bypass T2 J1J4 5.5 17-Mar-2025 4:00 pm	MAN Bypass T5 J1J2 7.5 19-Mar-2025 2:45 pm
Lab Number:		3841393.6	3841393.7	3841393.8	3841393.9	3841393.10
Dissolved Magnesium	g/m ³	3.6	3.6	3.7	3.6	23
Dissolved Manganese	g/m ³	0.45	0.44	0.45	0.45	1.20
Dissolved Nickel	g/m ³	0.094	0.093	0.099	0.100	0.075
Dissolved Zinc	g/m ³	0.31	0.24	0.35	0.50	0.0157
Dissolved Organic Carbon (DOC)	g/m ³	0.8	0.7	0.9	0.9	< 0.5
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.018	0.019	0.023	0.019
Transmittance at 254 nm*	%T, 1 cm cell	98.7	95.9	95.7	94.8	95.7

Sample Name:		MAN Bypass T6 J3J4 7.0 19-Mar-2025 3:45 pm	MAN Bypass T6 J1J2 6.5 19-Mar-2025 3:45 pm	MAN Bypass T4 J3J4 6.0 19-Mar-2025 1:30 pm	MAN Bypass T4 J1J2 5.5 19-Mar-2025 1:30 pm	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am
Lab Number:		3841393.11	3841393.12	3841393.13	3841393.14	3841393.15
Turbidity	NTU	2.8	2.8	1.72	1.85	4.9
pH	pH Units	6.6	6.7	6.5	5.9	8.0
Total Alkalinity	g/m ³ as CaCO ₃	10.1	11.8	7.3	4.0	14.5
Total Hardness	g/m ³ as CaCO ₃	630	650	640	620	560
Total Suspended Solids	g/m ³	26	26	17	-	-
Dissolved Aluminium	g/m ³	0.035	0.046	0.024	0.151	0.054
Dissolved Cadmium	g/m ³	0.00033	0.00020	0.00046	0.00072	< 0.00005
Dissolved Calcium	g/m ³	210	220	220	210	210
Dissolved Chromium	g/m ³	0.0007	0.0007	0.0008	< 0.0005	0.0014
Dissolved Cobalt	g/m ³	0.045	0.028	0.059	0.080	0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0010	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	0.00014	< 0.00010
Dissolved Magnesium	g/m ³	23	23	24	25	8.4
Dissolved Manganese	g/m ³	1.47	1.26	1.60	1.72	0.0054
Dissolved Nickel	g/m ³	0.129	0.087	0.160	0.197	0.0008
Dissolved Zinc	g/m ³	0.059	0.027	0.105	0.58	< 0.0010
Dissolved Organic Carbon (DOC)	g/m ³	< 0.5	0.5	< 0.5	0.6	1.5
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.003	0.004	0.003	0.007
Transmittance at 254 nm*	%T, 1 cm cell	99.1	99.2	99.1	99.2	98.3

Sample Name:		THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am
Lab Number:		3841393.16	3841393.17	3841393.18	3841393.19	3841393.20
Turbidity	NTU	8.8	-	1.33	0.16	0.12
pH	pH Units	8.5	-	7.3	7.1	6.9
Total Alkalinity	g/m ³ as CaCO ₃	20	-	15.7	10.7	9.1
Total Hardness	g/m ³ as CaCO ₃	540	1,930	1,930	650	640
Total Suspended Solids	g/m ³	-	-	-	4	< 3
Dissolved Aluminium	g/m ³	0.35	0.083	0.006	0.76	0.158
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	200	620	620	220	210
Dissolved Chromium	g/m ³	0.0018	0.0057	0.0059	0.0008	0.0007
Dissolved Cobalt	g/m ³	< 0.0002	0.0015	0.0012	0.0035	0.0197
Dissolved Copper	g/m ³	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	8.0	93	94	25	26
Dissolved Manganese	g/m ³	0.0043	0.31	0.33	0.59	1.37
Dissolved Nickel	g/m ³	0.0006	0.0016	0.0022	0.0121	0.058
Dissolved Zinc	g/m ³	< 0.0010	0.0014	0.0068	0.0032	0.0125
Dissolved Organic Carbon (DOC)	g/m ³	15	-	1.3	0.6	< 0.5

Sample Type: Aqueous					
Sample Name:	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am
Lab Number:	3841393.16	3841393.17	3841393.18	3841393.19	3841393.20
Absorbance at 254 nm AU cm ⁻¹	0.010	-	0.019	0.015	0.039
Transmittance at 254 nm* %T, 1 cm cell	97.6	-	95.8	96.5	91.3

Sample Name:	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm				
Lab Number:	3841393.21				
Turbidity NTU	0.08				
pH pH Units	6.9				
Total Alkalinity g/m ³ as CaCO ₃	8.4				
Total Hardness g/m ³ as CaCO ₃	640				
Total Suspended Solids g/m ³	< 3				
Dissolved Aluminium g/m ³	0.24				
Dissolved Cadmium g/m ³	< 0.00005				
Dissolved Calcium g/m ³	220				
Dissolved Chromium g/m ³	0.0007				
Dissolved Cobalt g/m ³	0.0179				
Dissolved Copper g/m ³	< 0.0005				
Dissolved Iron g/m ³	< 0.02				
Dissolved Lead g/m ³	< 0.00010				
Dissolved Magnesium g/m ³	24				
Dissolved Manganese g/m ³	1.13				
Dissolved Nickel g/m ³	0.053				
Dissolved Zinc g/m ³	0.0078				
Dissolved Organic Carbon (DOC) g/m ³	< 0.5				
Absorbance at 254 nm AU cm ⁻¹	0.005				
Transmittance at 254 nm* %T, 1 cm cell	98.8				

Analyst's Comments

Sample 2 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-16, 18-21
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-16, 18-21
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-16, 18-21
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-16, 18-21
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-21
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	5-13, 19-21

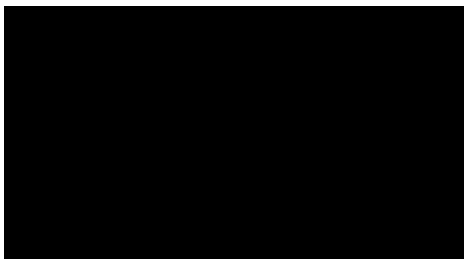
Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-21
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-21
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-21
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-21
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-21
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-21
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-21
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-21
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-21
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-16, 18-21
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-16, 18-21
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-16, 18-21

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

Testing was completed between 02-Apr-2025 and 09-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:		Mix Trial Man 2 - 0.01 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 2 : 1 16-Apr-2025 2:00 pm
Lab Number:		3862009.1	3862009.2	3862009.3	3862009.4	3862009.5
Individual Tests						
Turbidity	NTU	0.97	1.36	2.0	1.43	5.2
pH	pH Units	6.5	6.5	6.9	6.9	7.0
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Acidity (pH 7.0)	g/m ³ as CaCO ₃	2.0	1.5	1.5	1.0	< 1.0
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	4.0	6.0	4.5	4.0	6.5
Total Alkalinity	g/m ³ as CaCO ₃	3.9	4.1	6.4	7.3	8.8
Total Suspended Solids	g/m ³	< 3	< 3	4	8	9
Dissolved Aluminium	g/m ³	0.23	0.27	0.32	0.083	0.177
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0007
Dissolved Cobalt	g/m ³	0.0011	0.0011	0.0009	0.0009	0.0008
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	0.09	0.08	0.04	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Manganese	g/m ³	0.042	0.053	0.083	0.107	0.121
Dissolved Nickel	g/m ³	0.0018	0.0020	0.0022	0.0019	0.0019
Dissolved Thallium	g/m ³	0.00007	0.00020	0.00050	0.00071	0.00092
Dissolved Zinc	g/m ³	0.0078	0.0069	0.0049	0.0026	< 0.0010
Sulphate	g/m ³	11.3	50	172	250	340
Dissolved Organic Carbon (DOC)	g/m ³	3.7	3.5	2.1	1.0	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.142	0.120	0.077	0.026	0.015
Transmittance at 254 nm*	%T, 1 cm cell	72.1	75.8	83.8	94.2	96.7
Cation Profile						
Total Hardness	g/m ³ as CaCO ₃	15.8	59	190	280	360
Dissolved Calcium	g/m ³	4.4	19.9	67	101	129
Dissolved Magnesium	g/m ³	1.14	2.3	5.5	7.8	9.7
Dissolved Potassium	g/m ³	0.50	1.12	2.9	4.5	5.5
Dissolved Sodium	g/m ³	3.0	3.2	3.1	3.5	3.5

Sample Name:		Waimangaroa Raw 16-Apr-2025 2:00 pm	
Lab Number:		3862009.6	
Individual Tests			
Turbidity	NTU	1.70	
pH	pH Units	6.5	
Acidity (pH 5.5)	g/m³ as CaCO₃	< 1.0	
Acidity (pH 7.0)	g/m³ as CaCO₃	2.0	
Total Acidity (pH 8.3)	g/m³ as CaCO₃	6.0	



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous		
Sample Name:		Waimangaroa Raw 16-Apr-2025 2:00 pm
Lab Number:		3862009.6
Individual Tests		
Total Alkalinity	g/m ³ as CaCO ₃	4.0
Total Suspended Solids	g/m ³	< 3
Dissolved Aluminium	g/m ³	0.23
Dissolved Cadmium	g/m ³	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005
Dissolved Cobalt	g/m ³	0.0011
Dissolved Copper	g/m ³	0.0005
Dissolved Iron	g/m ³	0.09
Dissolved Lead	g/m ³	< 0.00010
Dissolved Manganese	g/m ³	0.040
Dissolved Nickel	g/m ³	0.0019
Dissolved Thallium	g/m ³	0.00007
Dissolved Zinc	g/m ³	0.0083
Sulphate	g/m ³	6.6
Dissolved Organic Carbon (DOC)	g/m ³	3.7
Absorbance at 254 nm	AU cm ⁻¹	0.142
Transmittance at 254 nm*	%T, 1 cm cell	72.0
Cation Profile		
Total Hardness	g/m ³ as CaCO ₃	11.0
Dissolved Calcium	g/m ³	2.6
Dissolved Magnesium	g/m ³	1.08
Dissolved Potassium	g/m ³	0.43
Dissolved Sodium	g/m ³	2.9

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Cation Profile		-	1-6
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-6
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-6
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-6
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-6
Total Acidity (pH 5.5)	Titration to pH 5.5 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Acidity (pH 7.0)	Titration to pH 7.0 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry, Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-6
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-6
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-6
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-6
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-6
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-6
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-6
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-6
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-6
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-6
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-6
Dissolved Thallium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-6
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-6
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-6
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-6
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-6
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-6

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

Testing was completed between 19-Apr-2025 and 24-Apr-2025. 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.

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APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing
ANALYTICAL REPORT

REPORT CODEAR-24-NW-046418-01REPORT DATE05/08/2024

Contact for your orders: [REDACTED] Order code: EUNZWE-00196988
Contract: Contract for Graymont (NZ) Limited
Submission Reference: Mak Oxd Purchase Order Number: 1017166

SAMPLE CODE812-2024-00109651

Sample Name Makareao Oxide 13-17/7
Sample Reference Makareao Oxide
Reception Date & Time: 02/08/2024 9:30
Analysis Started on: 03/08/2024 Analysis Ending Date: 05/08/2024
Product Type Quicklime Sampled Date & Time: 30/07/2024 00:00
Sampler(s) CUSTOMER

RESULTS

LOQ

NW499	Arsenic - Total			
	Arsenic (As)	0.34	mg/kg	0.05
NW504	Cadmium - Total			
	Cadmium (Cd)	0.64	mg/kg	0.01
NW507	Chromium - Total			
	Chromium (Cr)	8.8	mg/kg	0.2
NW509	Copper - Total			
	Copper (Cu)	1.3	mg/kg	0.3
NW511	Lead - Total			
	Lead (Pb)	0.5	mg/kg	0.1
NW515	Mercury - Total			
	Mercury (Hg)	<0.1	mg/kg	0.1
NW517	Nickel - Total			
	Nickel (Ni)	1.2	mg/kg	0.2

LIST OF METHODS

NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature

Food & Water Testing

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received.

Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

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END OF REPORT

SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15

New Zealand Supplier: **Graymont NZ**
 Address:

Telephone:

Emergency No:
Website:

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

Disclaimer

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

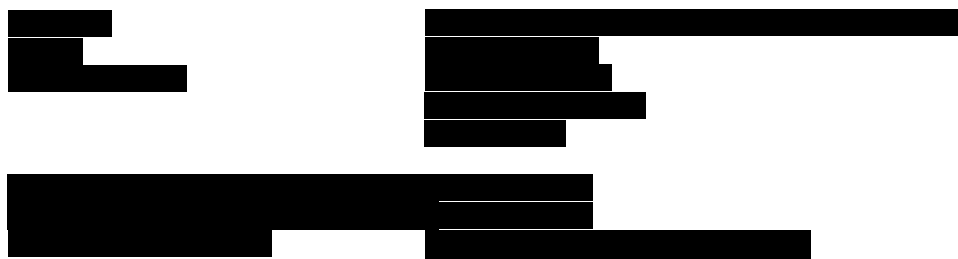
Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

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Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

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Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/7

BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier

[REDACTED]

Emergency information:

BASF Emergency Advice Number: 1800 803 440 (24h) [within Australia]

BASF Emergency Advice Number: + 61 3 8855 6666 [outside Australia]

[REDACTED]

2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

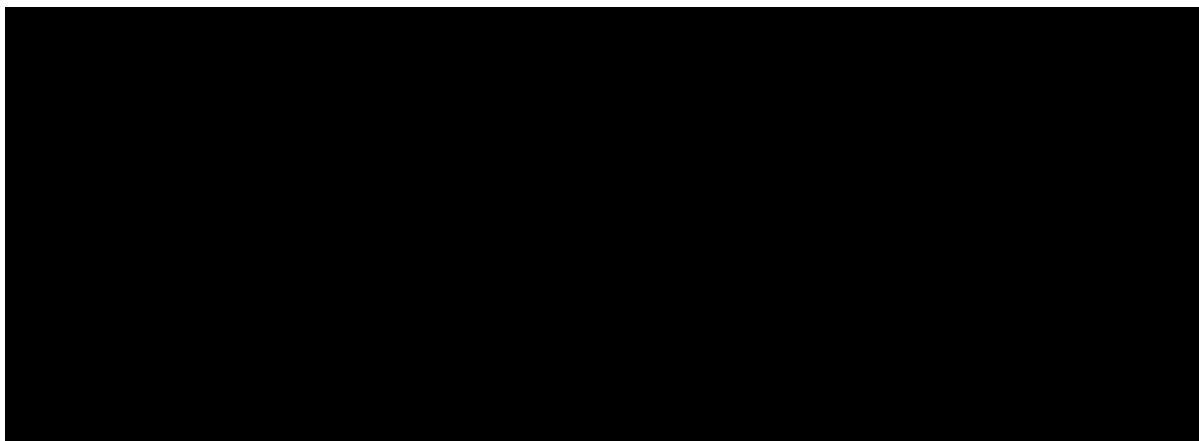
Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet



2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing. Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Melting point:	The substance / product decomposes therefore not determined.
Flash point:	not applicable
Solubility in water:	Forms a viscous solution.
Fire promoting properties:	not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:	No corrosive effect on metal.	
Formation of flammable gases:	Start temperature:	220 °C

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.

Supplier:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

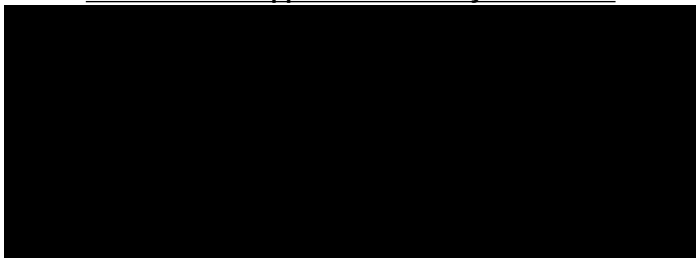
Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet



For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
------------------------------	---------------------------

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **SUPERFLOC B SERIES**

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.

Supplier:

NZBN:

Street Address:

Telephone Number:

Facsimile:

Emergency Telephone:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.

P264 Wash hands thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Company:

Telephone:

Telefax:

E-mail address:

1.4. Emergency telephone number

24-hour emergency number:

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix C – Sludge Characterisation Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	25/03/2026
Document Number:	PFL-2408-PRO-RPT-00004

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Client Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated following client review			G Smith	25/03/2026

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1 COLUMN SLUDGE TESTING

Column settling tests were performed in October 2024 to characterise quantities and qualities of sludge that might be produced at the WTP for mine water types Manchester St and S23.

The column settling process was repeated as per the process used in the previous report **PFL-2408-PRO-RPT-00002 – Appendix A – Bench and Column Water Treatment Tests** and with changes made for the sludge column testing as per the method outlined below.

1.1 Column Settling Testing Method

Settling Column Testing was performed to scale up the bench testing to replicate and/or improve on the Jar Scale tests. The volume scale up was 56 times the jar testing volume. 56L of sample water was used in the column tests. The columns were 2m tall and 200mm diameter with sample points at the following heights above base: 25mm, 245mm (P3), 500mm, 755mm, 995mm (P2), 1245mm, 1500mm, 1750mm (P1). Three Perspex settling columns were set up and a 200L plastic mixing barrel with stainless steel stirrer was used to blend the reagents.

Figure 1 Settling Columns



1.1.1 Rapid and Slow Mix

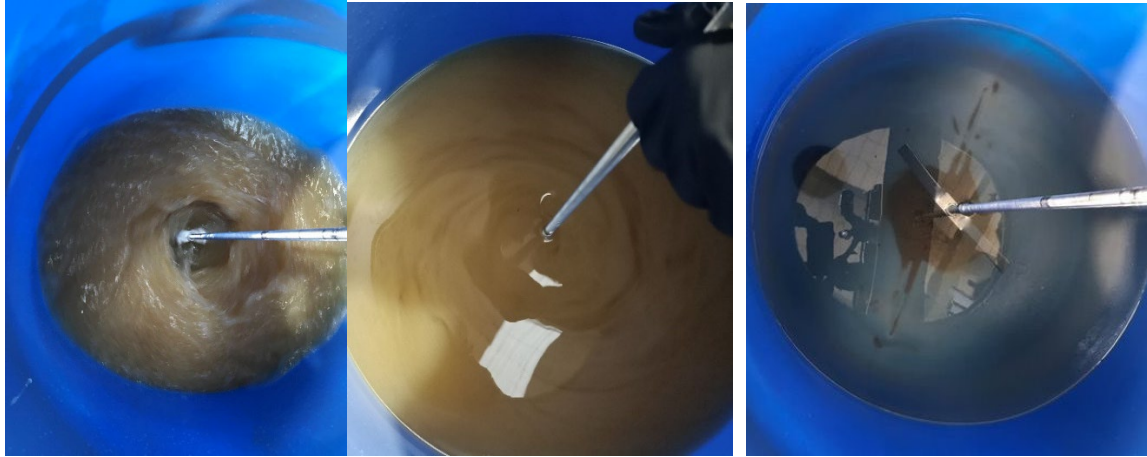
The Rapid mix speed was performed at 300 rpm using a calibrated drill press and the slow mix was performed at 30 rpm manually.

As per the bench scale testing rapid mix of 20 minutes was used for neutralisation, 1 minute for coagulant addition and 1 minute for flocculant addition.

During slow mix, most tests had 10 minutes duration, but for some tests the floc formed rapidly in the mixing drum so the slow mix time was reduced or in some cases the sample was transferred

immediately to the column, eliminating the slow mix phase (Column Tests T3 - 5 mins slow mix and T7, T8, T9 had no slow mix).

Figure 2 Barrel Mixer Rapid Mix (Left), Slow mix suspended floc formation (Middle) and Floc settling during slow mix (Right)



1.1.2 Settling

Sample was transferred to the columns by opening a 50mm ball valve at the base of the lifted mixing barrel and dropping the sample down the inside wall of the column. Despite the turbulence created by the transfer, flocs were still present in the columns following the transfer process.

Figure 3 Column Settler showing Floc reformation after water transfer



1.2 Results

For the Sludge column testing in October 2024, the main settling interface depth was measured over time and Supernatant samples were taken at the following times during the settling phase at 30 minutes and 24 hours. Sludge Samples were taken at 30 minutes and 24 hours also. Analysis of the settling rates, supernatant quality and sludge quality can be seen in the results section below.

1.2.1 Column Settling Results

Tables 1 and figures 4 and 5 below show that most of the AMD treatment and settling tests produced floc that settled well after 5 minutes and 30 minutes, except for T12 and T13 which both had S23 AMD and sediment treated with SuperflocBX5/and Crystalfloc610H. Column Test settling rates ranged from around 22m/hr to 2m/hr depending on Raw Water and Chemical combination. Settling Rates were as good as or better than previous settling column testing in the first report PFL-2408-PRO-RPT-000002.

S23 performed better for settling with the MetalsorbFZ/Rheomax1050 combination of coagulant/flocculant. Manchester St AMD showed good settling with both chemical combinations MetalsorbFZ/Rheomax1050 and SuperflocBX5/and Crystalfloc610H.

Table 1 Column Tests T10-T18 Settling Rates - No Scale Up Factor for WTP Sizing Applied

COLUMN TEST NUMBER	T10 C1 S23 SED	T11 C2 S23 SED	T12 C1 S23 SED	T13 C1 S23 SED	T14 C3 MAN SED	T15 C2 MAN SED	T16 C1 MAN SED	T17 C1 MAN SED	T18 C2 MAN SED
Coagulant/ Flocculant *	M/R	M/R	S/C	S/C	M/R	M/R	M/R	S/C	S/C
5 minute Settling Rate m/hr	22.5	21.72	13.8	2.4	23.184	23.1	23.16	21.96	21.84
30 minute Settling Rate m/hr	3.79	3.71	3.18	2.03	3.89	3.876	3.88	3.792	3.786

*M/R = MetalsorbFZ /Rheomax1050 S/C = SuperflocBX5/Crystalfloc610H

Figure 4 Column Testing October 2024 - Settling Rates

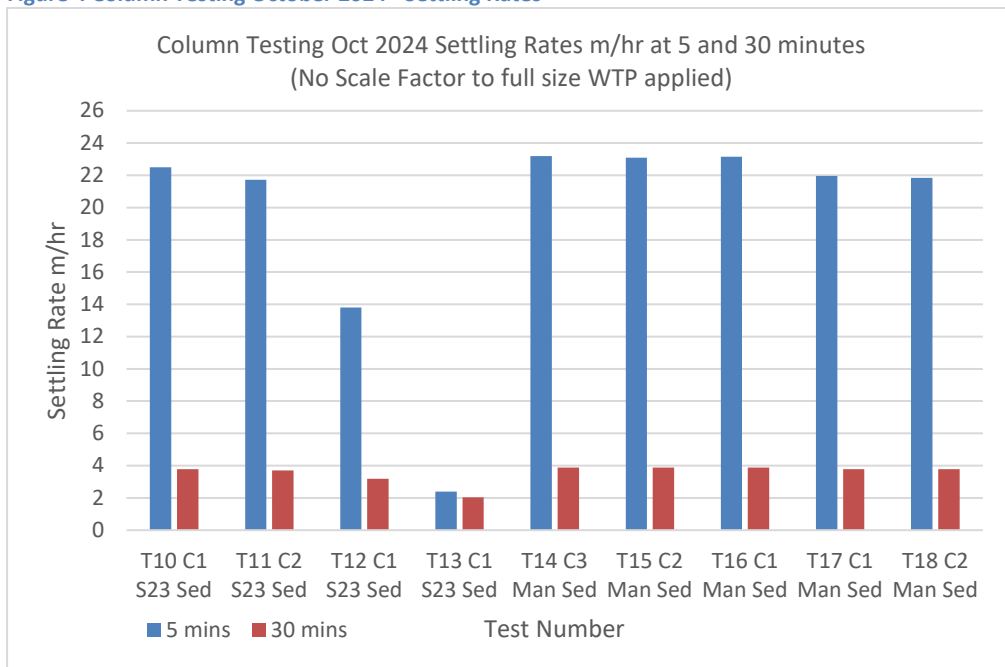
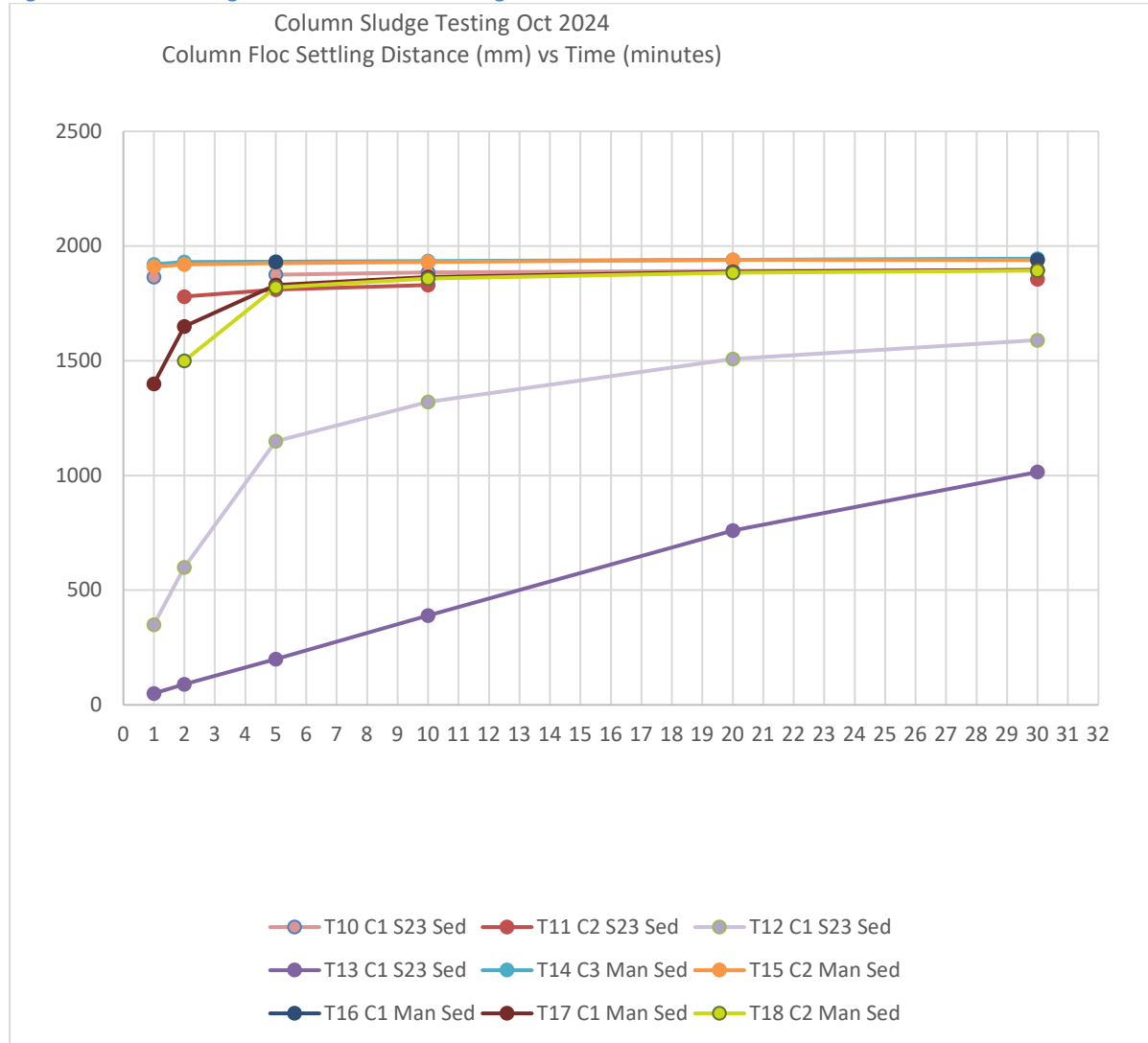


Figure 5 Column Testing October 2024 - Floc settling distance with time



1.2.2 Supernatant Results for Column Tests

Although the primary reason for these tests was to create sludge for characterisation, the supernatant quality has been tested, to compare with previous bench and column scale tests for treated water quality achieved.

Tests T10-T13 were performed with S23 sample water and T14, T16, T17 and T18 were with Manchester St sample water.

The results of supernatant (treated water) from the column testing Tests 10-18 showed compliance with the modified Chronic Guideline Limits for most metals except Aluminium (when the pH was higher), and Nickel, Zinc Cobalt and Manganese (when pH was lower).

Column Tests 10 (S23 with Metalsorb/Rheomax) complied with the all the dissolved metals modified Guideline Values but did not meet the suspended solids and pH treated targets.

Test 11 (S23 with Metalsorb/Rheomax) and 13 (S23 with SuperflocBX5 and Crystalfloc610H) complied with all metals GVs except aluminium and did not meet the suspended solids and pH treated targets.

Test 12 (S23 with SuperflocBX5/and Crystalfloc610H) did not comply with Manganese GV and pH and TSS treated targets. This sample did not settle well.

Test 14 (Manchester with Metalsorb/Rheomax) and Test 17 (Manchester with SuperflocBX5/and Crystalfloc610H) complied with all metal GVs except for aluminium and the pH treated target.

Test 16 (Manchester with Metalsorb/Rheomax) complied with metal GVs except for aluminium and pH and TSS treated targets.

Test 18 (Manchester St with SuperflocBX5/and Crystalfloc610H) did not comply with Cobalt, Nickel and Zinc GVs and the pH treated target.

The MetalsorbFZ/Rheomax1050 combination of coagulant/flocculant was more reliable across Manchester St and S23 waters, and this also was found with the better settling for this combination. The results presented in Tables 2 to 4 below are a summary of supernatant qualities achieved while carrying out sludge testing. Tables 5 and 6 below show parameters for sludge creation and analysed results for sludge.

- Table 2 – Test parameters for column scale testing carried out in October 2024
- Table 3 – Analysed results for S23 & MAN column scale testing carried out in October 2024
- Table 4 – Analysed results for S23 column scale testing carried out in October 2024
- Table 5 – Test parameters for sludge testing carried out in October 2024
- Table 6 – Analysed results for sludge quality testing carried out in October 2024

Table 2 Column Scale Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation – October 2024 – S23 OLD and Manchester OLD

PF Test Number Identifier and Date Sample Sent for Analysis		T10 C1 P1 30Min 15-Oct-2024 1:00 pm	T11 C2 P1 24H 17-Oct-2024 10:20 am	T12 C1 P1 30Min 16-Oct-2024 1:53 pm	T13 C1 P1 24H Supernatant 18-Oct-2024 10:15 am	T14 C3 P1 24H Super 18-Oct-2024 12:20 pm	T16 C1 P1 Super 18-Oct-2024 12:30 pm	T17 C1 P1 30Min 21-Oct-2024 10:43 am	T18c2 P1 24H Supernatant 22-Oct-2024 11:43 am
Hills Lab Number:		3698774.1	3698774.2	3698774.3	3698774.4	3698774.5	3698774.6	3698774.7	3699791.1
Sample		S23	S23	S23	S23	Manchester	Manchester	Manchester	Manchester
Neutralant		CaO 4.8mL/L 20% Slurry	CaO 4.9mL/L 20% Slurry	CaO 4.7mL/L 20% Slurry	CaO 4.8mL/L 20% Slurry	CaO 1.33mL/L 20% Slurry	CaO 1.3mL/L 20% Slurry	CaO 1.3mL/L 20% Slurry	CaO 1.3mL/L 20% Slurry
Coagulant		MetalsorbFZ 2.5mL/L 0.1%soln	MetalsorbFZ 2.5mL/L 0.1%soln	SuperflocBX5 3mL/L 0.1%soln	SuperflocBX5 3mL/L 0.1%soln	MetalsorbFZ 2mL/L 0.1%soln	MetalsorbFZ 2mL/L 0.1%soln	SuperflocBX5 1mL/L 0.1%soln	SuperflocBX5 1mL/L 0.1%soln
Flocculant		Rheomax1050 3mL/l 0.1%Soln	Rheomax1050 3mL/l 0.1%Soln	Crystalfloc610H 1mL/l 0.1% soln	Crystalfloc610H 1mL/l 0.1% soln	Rheomax1050 1.5mL/l 0.1%Soln	Rheomax1050 1.5mL/l 0.1%Soln	Crystalfloc610H 1mL/l 0.1% soln	Crystalfloc610H 1mL/l 0.1% soln
Sediment added		3g/L	3g/L	3g/L	3g/L	3g/L	3g/L	3g/L	3g/L
Rapid Mix time (Neutralisation)	mins	40	20	20	20	20	20	20	20
Rapid Mix time for coagulant addition	mins	1	1	1	1	1	1	1	1
Rapid Mix time for flocculant addition	mins	1	1	1	1	1	1	1	1
Slow Mix Time	mins	10	0	0	10	0	0	5	5
Settling Time		30 minutes	24hr	30 minutes	24hr	30 minutes	24hr	30 minutes	24hr
Test Vessel Size		Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 3 Column Scale Supernatant Water Quality Results October 2024 - Manchester

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	T14 C3 P1 24H Super 18-Oct-2024 12:20 pm	T16 C1 P1 Super 18-Oct-2024 12:30 pm	T17 C1 P1 30Min 21-Oct-2024 10:43 am	T18c2 P1 24H Supernatant 22-Oct-2024 11:43 am
Turbidity	NTU	19.8	0.76	1.29	0.54	1.9
Turbidity Target	NTU		5	5	5	5
pH	pH Units	3.2	8	8.2	7.6	7.7
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	18.4	19.4	13.2	105
Total Hardness	g/m3 as CaCO3	270	620	610	580	220
Electrical Conductivity (EC)	mS/m	114.4				
Total Suspended Solids	g/m3	<70	5	6	4	< 300 #1
TSS Target	g/m3		5	5	5	5
Dissolved Aluminium	g/m3	51	1.22	1.1	0.62	0.05
Dissolved Aluminium Chronic GV 95%	g/m3		0.36	0.43	0.25	0.22
Dissolved Aluminium Chronic GV 90%	g/m3		0.46	0.55	0.32	0.28
Dissolved Aluminium Chronic GV 80%	g/m3		0.62	0.75	0.43	0.38
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005	0.00028
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00030
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00056
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00127
Dissolved Calcium	g/m3	69	210	210	199	83
Dissolved Chromium	g/m3	0.0051	0.001	0.001	0.001	< 0.0005
Dissolved Cobalt	g/m3	0.094	0.0017	0.0023	0.0068	0.0062
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0026
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0061
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0163
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0011	0.0013	0.0008	0.0007

Dissolved Copper Chronic GV 90%	g/m3		0.0013	0.0015	0.0010	0.0009
Dissolved Copper Chronic GV 80%	g/m3		0.0021	0.0024	0.0016	0.0014
Dissolved Iron	g/m3	13.2	0.02	0.02	< 0.02	< 0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	21	21	21	2
Dissolved Manganese	g/m3	1.99	0.33	0.37	0.65	0.003
Dissolved Manganese Chronic GV 95%	g/m3		1.22	1.21	1.21	0.79
Dissolved Manganese Chronic GV 90%	g/m3		1.87	1.86	1.86	1.22
Dissolved Manganese Chronic GV 80%	g/m3		3.05	3.03	3.03	1.99
Dissolved Nickel	g/m3	0.23	0.0076	0.0105	0.024	0.072
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.060
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.071
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.092
Dissolved Zinc	g/m3	1.11	< 0.0010	< 0.0010	0.0012	0.48
Dissolved Zinc Chronic GV 95%	g/m3		0.042	0.042	0.049	0.024
Dissolved Zinc Chronic GV 90%	g/m3		0.062	0.062	0.074	0.036
Dissolved Zinc Chronic GV 80%	g/m3		0.107	0.107	0.127	0.062
Dissolved Organic Carbon (DOC)	g/m3		0.9	1.1	0.6	< 0.5
Absorbance at 254 nm	AU cm-1	0.518	0.012	0.008	0.01	0.007
Transmittance at 254 nm	%T, 1 cm cell	30.3	97.2	98.1	97.6	98.3
Iron + Manganese		15.19	0.35	0.39	0.67	0.003
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3		2.22	2.21	2.21	1.79

#1 Due to the insufficient sample volume, the detection limit achieved and the analytical variation is greater than normal.

Table 4 Column Scale Supernatant Water Quality Results – October 2024 – S23

PF Test Number Identifier and Date Sample Sent for Analysis		S23 Old Raw Water Sample	T10 C1 P1 30Min 15- Oct-2024 1:00 pm	T11 C2 P1 24H 17- Oct-2024 10:20 am	T12 C1 P1 30Min 16- Oct-2024 1:53 pm	T13 C1 P1 24H Supernatant 18-Oct-2024 10:15 am
Turbidity	NTU	0.32	0.92	3.2	1.43	1.29
Turbidity Target	NTU		5	5	5	5
pH	pH Units	2.6	7.3	8.4	7.2	8.3
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	< 1.0	11.2	22	10.3	20
Total Hardness	g/m3 as CaCO3	810	1,950	1,960	1,950	1,940
Electrical Conductivity (EC)	mS/m	339				
Total Suspended Solids	g/m3	< 8	17	13	8	8
TSS Target	g/m3		5	5	5	5
Dissolved Aluminium	g/m3	168	0.18	1.16	0.2	1.24
Dissolved Aluminium Chronic GV 95%	g/m3		0.36	0.46	0.29	0.39
Dissolved Aluminium Chronic GV 90%	g/m3		0.46	0.58	0.37	0.50
Dissolved Aluminium Chronic GV 80%	g/m3		0.62	0.79	0.50	0.68
Dissolved Cadmium	g/m3	0.0026	< 0.00005	< 0.00005	0.00012	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	169	640	660	640	650
Dissolved Chromium	g/m3	0.077	0.0031	0.0035	0.0031	0.0035
Dissolved Cobalt	g/m3	0.24	0.0022	< 0.0002	0.0112	< 0.0002
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.055	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Dissolved Copper Chronic GV 95%	g/m3		0.0013	0.0013	0.0011	0.0011
Dissolved Copper Chronic GV 90%	g/m3		0.0016	0.0015	0.0013	0.0013
Dissolved Copper Chronic GV 80%	g/m3		0.0026	0.0024	0.0021	0.0021
Dissolved Iron	g/m3	89	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1.0	1.0	1.0	1.0
Dissolved Lead	g/m3	0.00017	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	93	84	78	88	76
Dissolved Manganese	g/m3	7.9	1.07	0.41	2.2	0.4
Dissolved Manganese Chronic GV 95%	g/m3		1.25	1.25	1.25	1.25
Dissolved Manganese Chronic GV 90%	g/m3		1.93	1.93	1.93	1.93
Dissolved Manganese Chronic GV 80%	g/m3		3.15	3.15	3.15	3.15
Dissolved Nickel	g/m3	4.7	0.0036	< 0.0005	0.035	< 0.0005
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	3.9	0.0057	< 0.0010	0.0029	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.083	0.042	0.080	0.039
Dissolved Zinc Chronic GV 90%	g/m3		0.124	0.062	0.120	0.058
Dissolved Zinc Chronic GV 80%	g/m3		0.213	0.107	0.206	0.099
Dissolved Organic Carbon (DOC)	g/m3	1.2	1.2	1.1	0.9	0.9
Absorbance at 254 nm	AU cm-1	3.11	0.012	0.013	0.009	0.01
Transmittance at 254 nm	%T, 1 cm cell	< 0.5	97.2	97.1	98.1	97.8
Iron + Manganese		96.9	1.09	0.43	2.22	0.42
Dissolved Iron + Manganese Chronic GV 80%/90%/95%	g/m3		2.25	2.25	2.25	2.25

Table 5 Column Testing October 2024 Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling - Sludge

PF Test Number Identifier and Date Sample Sent for Analysis		T10 C1 30 MIN SLUDGE 15- Oct-2024 1:45 pm	T11 C2 24H SLUDGE 17- Oct-2024 10:20 am	T12 C1 30 MIN SLUDGE 16-Oct- 2024 1:53 pm	T13 C1 24H SLUDGE 18-Oct- 2024 10:15 am	T16 C1 30 MIN SLUDGE 18-Oct- 2024 12:30 pm	T14 C3 24H SLUDGE 18-Oct- 2024 12:20 pm	T17 C1 30 MIN SLUDGE 21-Oct- 2024 10:43 am	T18C2 24H SLUDGE 22-Oct- 2024 11:43 am
Hills Lab Number:		3698773.1	3698773.2	3698773.3	3698773.4	3698773.6	3698773.5	3698773.7	3699790.1
Sample		S23	S23	S23	S23	Manchester	Manchester	Manchester	Manchester
Neutralent		CaO 4.8mL/L 20% Slurry	CaO 4.9mL/L 20% Slurry	CaO 4.7mL/L 20% Slurry	CaO 4.8mL/L 20% Slurry	CaO 1.33mL/L 20% Slurry	CaO 1.3mL/L 20% Slurry	CaO 1.3mL/L 20% Slurry	CaO 1.3mL/L 20% Slurry
Coagulant		MetalsorbFZ 2.5mL/L 0.1%soln	MetalsorbFZ 2.5mL/L 0.1%soln	SuperflocBX5 3mL/L 0.1%soln	SuperflocBX5 3mL/L 0.1%soln	MetalsorbFZ 2mL/L 0.1%soln	MetalsorbFZ 2mL/L 0.1%soln	SuperflocBX5 1mL/L 0.1%soln	SuperflocBX5 1mL/L 0.1%soln
Flocculant		Rheomax1050 3mL/l 0.1%Soln	Rheomax1050 3mL/l 0.1%Soln	Crystalfloc610H 1mL/l 0.1% soln	Crystalfloc610H 1mL/l 0.1% soln	Rheomax1050 1.5mL/l 0.1%Soln	Rheomax1050 1.5mL/l 0.1%Soln	Crystalfloc610H 1mL/l 0.1% soln	Crystalfloc610H 1mL/l 0.1% soln
Sediment added		3g/L	3g/L	3g/L	3g/L	3g/L	3g/L	3g/L	3g/L
Rapid Mix time (Neutralisation)	mins	40	20	20	20	20	20	20	20
Rapid Mix time for coagulant addition	mins	1	1	1	1	1	1	1	1
Rapid Mix time for flocculant addition	mins	1	1	1	1	1	1	1	1
Slow Mix Time	mins	10	0	0	10	0	0	5	5
Settling Time		30 minutes	24hr	30 minutes	24hr	30 minutes	24hr	30 minutes	24hr
Test Vessel Size		Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres	Column 56 litres

Table 6 Column Testing October 2024 Tests - Sludge Quality Results

PROCESS - AMD AND REAGENTS		S23 METALSORB/ RHEOMAX	S23 METALSORB/ RHEOMAX	S23 SUPERFLOC/ CRYSTALFLOC	S23 SUPERFLOC/ CRYSTALFLOC	MANCHESTER ST METALSORB/ RHEOMAX	MANCHESTER ST METALSORB/ RHEOMAX	MANCHESTER ST SUPERFLOC/ CRYSTALFLOC	MANCHESTER ST SUPERFLOC/ CRYSTALFLOC
Settling Time	Hours	0.5	24	0.5	24	0.5	24	0.5	24
Test Number, Settling Time, Sample Date & Time	Sample Name:	T10 C1 30 MIN SLUDGE 15-Oct-2024 1:45 pm	T11 C2 24H SLUDGE 17-Oct-2024 10:20 am	T12 C1 30 MIN SLUDGE 16-Oct-2024 1:53 pm	T13 C1 24H SLUDGE 18-Oct-2024 10:15 am	T16 C1 30 MIN SLUDGE 18-Oct-2024 12:30 pm	T14 C3 24H SLUDGE 18-Oct-2024 12:20 pm	T17 C1 30 MIN SLUDGE 21-Oct-2024 10:43 am	T18C2 24H SLUDGE 22-Oct-2024 11:43 am
Hills Lab Number	Lab Number:	3698773.1	3698773.2	3698773.3	3698773.4	3698773.6	3698773.5	3698773.7	3699790.1
pH	pH Units	8.2	8.5	7.9	8.5	8.8	8.7	8.3	8.4
Total Aluminium	g/m3	2,100	2,000	840	1,820	1,130	1,150	860	1,270
Total Arsenic	g/m3	0.5	0.4	0.21	0.41	0.026	0.031	< 0.021	0.027
Total Cadmium	g/m3	0.049	0.045	0.0157	0.036	0.024	0.023	0.0155	0.02
Total Chromium	g/m3	1.27	1.14	0.39	0.96	0.155	0.167	0.113	0.157
Total Cobalt	g/m3	3.7	3.5	1.26	2.8	2.1	2.1	1.52	2.1
Total Iron	g/m3	1,510	1,370	480	1,120	340	330	230	330
Total Lead	g/m3	0.025	0.025	0.0099	0.023	0.063	0.068	0.046	0.063
Total Magnesium	g/m3	320	380	150	340	105	107	71	83
Total Manganese	g/m3	109	107	31	89	40	39	25	33
Total Nickel	g/m3	10.8	10.1	3.4	8.4	5.1	5.2	3.5	5
Total Sodium	g/m3	5	4.9	4.9	5	4	4.2	4.2	4.4
Total Zinc	g/m3	49	51	21	46	27	27	19.8	26
Chloride	g/m3	5.4	5.4	12.2	12.7	3.9	3.9	6.1	8 #1
Nitrite-N	g/m3	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate-N	g/m3	0.14	0.13	0.14	0.13	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate-N + Nitrite-N	g/m3	0.14	0.13	0.14	0.13	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate	g/m3	2,600	2,600	2,500	2,500	750	760	730	650
Hills Test Sludge Dry Matter	g/100g as rcvd	3.1	2.2	0.81	1.61	2.1	1.63	0.7	0.97

Table 7 Column Testing October 2024 Tests - Calculated Sludge Volumes and Densities

PROCESS - AMD AND REAGENTS		S23 METALSORB/ RHEOMAX	S23 METALSORB/ RHEOMAX	S23 SUPERFLOC/ CRYSTALFLOC	S23 SUPERFLOC/ CRYSTALFLOC	MANCHESTER ST METALSORB/ RHEOMAX	MANCHESTER ST METALSORB/ RHEOMAX	MANCHESTER ST SUPERFLOC/ CRYSTALFLOC	MANCHESTER ST SUPERFLOC/ CRYSTALFLOC
Settling Time	Hrs	0.5	24	0.5	24	0.5	24	0.5	24
Test Number		T10 C1	T11 C2	T12 C1	T13 C1	T16 C1	T14 C3	T17 C1	T18C2
Depth of Sludge in total 2000mm high Column full of Settled Water		105	115	410	170	60	49	104	82
Sludge Depth	m	0.105	0.115	0.410	0.170	0.060	0.049	0.104	0.082
Diameter Column	m	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Surface Area	m ²	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283	0.0283
Volume of Aqueous Sludge per 56 litre test	m ³	0.00298	0.00326	0.01162	0.00482	0.00170	0.00139	0.00295	0.00232
Volume Sludge	L	2.98	3.26	11.62	4.82	1.70	1.39	2.95	2.32
% Volume Sludge	%	5.3	5.8	20.7	8.6	3.0	2.5	5.3	4.1
Volume of Supernatant per 56 litre test	L	53.02	52.74	44.38	51.18	54.30	54.61	53.05	53.68
% Volume Supernatant	%	94.7	94.2	79.3	91.4	97.0	97.5	94.7	95.9
Aqueous Sludge densities	calculated by	Process Flow			In house				
Sludge Sample Vol	mL	1000	1000	1000	1000	711	625	1000	1000
Sludge Sample mass	g	1014	1018	1003	1010	724	642	1004	1007
Sludge Density	g/ml	1.014	1.018	1.003	1.01	1.018284107	1.0272	1.004	1.007
Sludge Density	g/l	1014	1018	1003	1010	1018.284107	1027.2	1004	1007
Hills Test Sludge Dry Matter	g/100g as rcvd	3.1	2.2	0.81	1.61	2.1	1.63	0.7	0.97

APPENDIX A –WATER AND SLUDGE QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3698773-SP-1

3698774-SP-1

3699790-SP-1

3699791-SP-2

Sample Type: Aqueous						
Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Hardness	g/m ³ as CaCO ₃	640	2,300	630	2,200	200
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Hardness	g/m ³ as CaCO ₃	650	650	640	630	640
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24



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Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Hardness	g/m ³ as CaCO ₃	2,200	2,200	196	197	620
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Hardness	g/m ³ as CaCO ₃	630	2,100	2,200	210	210
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments

Sample 20 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces report '3668046-SPv1' issued on 17-Sep-2024 at 2:08 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Jun-2025. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

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Sample Type: Aqueous

Sample Name:		T10 C1 30 MIN SLUDGE 15-Oct-2024 1:45 pm	T11 C2 24H SLUDGE 17-Oct-2024 10:20 am	T12 C1 30 MIN SLUDGE 16-Oct-2024 1:53 pm	T13 C1 24H SLUDGE 18-Oct-2024 10:15 am	T14 C3 24H SLUDGE 18-Oct-2024 12:20 pm
Lab Number:		3698773.1	3698773.2	3698773.3	3698773.4	3698773.5
Dry Matter	g/100g as rcvd	3.1	2.2	0.81	1.61	1.63
pH	pH Units	8.2	8.5	7.9	8.5	8.7
Total Aluminium	g/m ³	2,100	2,000	840	1,820	1,150
Total Arsenic	g/m ³	0.50	0.40	0.21	0.41	0.031
Total Cadmium	g/m ³	0.049	0.045	0.0157	0.036	0.023
Total Chromium	g/m ³	1.27	1.14	0.39	0.96	0.167
Total Cobalt	g/m ³	3.7	3.5	1.26	2.8	2.1
Total Iron	g/m ³	1,510	1,370	480	1,120	330
Total Lead	g/m ³	0.025	0.025	0.0099	0.023	0.068
Total Magnesium	g/m ³	320	380	150	340	107
Total Manganese	g/m ³	109	107	31	89	39
Total Nickel	g/m ³	10.8	10.1	3.4	8.4	5.2
Total Sodium	g/m ³	5.0	4.9	4.9	5.0	4.2
Total Zinc	g/m ³	49	51	21	46	27
Chloride	g/m ³	5.4	5.4	12.2	12.7	3.9
Nitrite-N	g/m ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrate-N	g/m ³	0.14	0.13	0.14	0.13	< 0.10
Nitrate-N + Nitrite-N	g/m ³	0.14	0.13	0.14	0.13	< 0.10
Sulphate	g/m ³	2,600	2,600	2,500	2,500	760

Sample Name:		T16 C1 30 MIN SLUDGE 18-Oct-2024 12:30 pm	T17 C1 30 MIN SLUDGE 21-Oct-2024 10:43 am
Lab Number:		3698773.6	3698773.7
Dry Matter	g/100g as rcvd	2.1	0.70
pH	pH Units	8.8	8.3
Total Aluminium	g/m ³	1,130	860
Total Arsenic	g/m ³	0.026	< 0.021
Total Cadmium	g/m ³	0.024	0.0155
Total Chromium	g/m ³	0.155	0.113
Total Cobalt	g/m ³	2.1	1.52
Total Iron	g/m ³	340	230
Total Lead	g/m ³	0.063	0.046
Total Magnesium	g/m ³	105	71
Total Manganese	g/m ³	40	25
Total Nickel	g/m ³	5.1	3.5
Total Sodium	g/m ³	4.0	4.2
Total Zinc	g/m ³	27	19.8
Chloride	g/m ³	3.9	6.1



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Sample Type: Aqueous			
Sample Name:		T16 C1 30 MIN SLUDGE 18-Oct-2024 12:30 pm	T17 C1 30 MIN SLUDGE 21-Oct-2024 10:43 am
Lab Number:		3698773.6	3698773.7
Nitrite-N	g/m ³	< 0.10	< 0.10
Nitrate-N	g/m ³	< 0.10	< 0.10
Nitrate-N + Nitrite-N	g/m ³	< 0.10	< 0.10
Sulphate	g/m ³	750	730

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-7
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-7
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-7
pH	pH meter. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Aluminium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.063 g/m ³	1-7
Total Arsenic	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-7
Total Cadmium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0011 g/m ³	1-7
Total Chromium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-7
Total Cobalt	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0042 g/m ³	1-7
Total Iron	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-7
Total Lead	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0021 g/m ³	1-7
Total Magnesium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-7
Total Manganese	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-7
Total Nickel	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-7
Total Sodium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-7
Total Zinc	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-7
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-7
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser, screen level. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-7
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser, screen level. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1-7
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-7

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

Testing was completed between 24-Oct-2024 and 31-Oct-2024. 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.

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Sample Type: Aqueous

Sample Name:		T10 C1 P1 30Min 15-Oct-2024 1:00 pm	T11 C2 P1 24H 17-Oct-2024 10:20 am	T12 C1 P1 30Min 16-Oct-2024 1:53 pm	T13 C1 P1 24H Supernatant 18-Oct-2024 10:15 am	T14 C3 P1 24H Super 18-Oct-2024 12:20 pm
Lab Number:		3698774.1	3698774.2	3698774.3	3698774.4	3698774.5
Turbidity	NTU	0.92	3.2	1.43	1.29	0.76
pH	pH Units	7.3	8.4	7.2	8.3	8.0
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Acidity (pH 7.0)	g/m ³ as CaCO ₃	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	3.9	2.0	2.1	2.1	2.1
Total Alkalinity	g/m ³ as CaCO ₃	11.2	22	10.3	20	18.4
Free Carbon Dioxide	g/m ³ at 25°C	1.1	< 1.0	1.4	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	1,950	1,960	1,950	1,940	620
Total Suspended Solids	g/m ³	17	13	8	8	5
Total Solids (TS)	g/m ³	3,300	3,300	3,300	3,300	990
Dissolved Aluminium	g/m ³	0.180	1.16	0.20	1.24	1.22
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00012	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	640	660	640	650	210
Dissolved Chromium	g/m ³	0.0031	0.0035	0.0031	0.0035	0.0010
Dissolved Cobalt	g/m ³	0.0022	< 0.0002	0.0112	< 0.0002	0.0017
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	84	78	88	76	21
Dissolved Manganese	g/m ³	1.07	0.41	2.2	0.40	0.33
Dissolved Nickel	g/m ³	0.0036	< 0.0005	0.035	< 0.0005	0.0076
Dissolved Zinc	g/m ³	0.0057	< 0.0010	0.0029	< 0.0010	< 0.0010
Chloride	g/m ³	5.8	5.7	12.9	13.0	4.6
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	0.114	0.113	0.116	0.112	0.004
Nitrate-N + Nitrite-N	g/m ³	0.114	0.113	0.116	0.113	0.004
Sulphate	g/m ³	2,800	3,000	3,300	3,100	760
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.1	0.9	0.9	0.9
Absorbance at 254 nm	AU cm ⁻¹	0.012	0.013	0.009	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	97.2	97.1	98.1	97.8	97.2

Sample Name:		T16 C1 P1 Super 18-Oct-2024 12:30 pm	T17 C1 P1 30Min 21-Oct-2024 10:43 am
Lab Number:		3698774.6	3698774.7
Turbidity	NTU	1.29	0.54
pH	pH Units	8.2	7.6
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.1	< 1.1
Acidity (pH 7.0)	g/m ³ as CaCO ₃	< 1.1	< 1.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	2.1	1.6



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Sample Type: Aqueous			
Sample Name:		T16 C1 P1 Super 18-Oct-2024 12:30 pm	T17 C1 P1 30Min 21-Oct-2024 10:43 am
Lab Number:		3698774.6	3698774.7
Total Alkalinity	g/m ³ as CaCO ₃	19.4	13.2
Free Carbon Dioxide	g/m ³ at 25°C	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	610	580
Total Suspended Solids	g/m ³	6	4
Total Solids (TS)	g/m ³	980	990
Dissolved Aluminium	g/m ³	1.10	0.62
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	199
Dissolved Chromium	g/m ³	0.0010	0.0010
Dissolved Cobalt	g/m ³	0.0023	0.0068
Dissolved Copper	g/m ³	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	21	21
Dissolved Manganese	g/m ³	0.37	0.65
Dissolved Nickel	g/m ³	0.0105	0.024
Dissolved Zinc	g/m ³	< 0.0010	0.0012
Chloride	g/m ³	3.6	6.0
Nitrite-N	g/m ³	< 0.002	< 0.002
Nitrate-N	g/m ³	< 0.002	0.002
Nitrate-N + Nitrite-N	g/m ³	0.002	0.002
Sulphate	g/m ³	770	780
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.008	0.010
Transmittance at 254 nm*	%T, 1 cm cell	98.1	97.6

Analyst's Comments

Sample 7 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-7
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-7
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-7
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Acidity (pH 5.5)	Titration to pH 5.5 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Acidity (pH 7.0)	Titration to pH 7.0 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Free Carbon Dioxide	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D : Online Edition.	1.0 g/m ³ at 25°C	1-7
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-7
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-7
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-7
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-7
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-7
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-7
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-7
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-7
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-7
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-7
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-7
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-7
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-7
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-7
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-7
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-7
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-7
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-7
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-7
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-7

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

Testing was completed between 22-Oct-2024 and 31-Oct-2024. 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.

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Sample Type: Aqueous

Sample Name:		T18C2 24H SLUDGE 22-Oct-2024 11:43 am
Lab Number:		3699790.1
Dry Matter	g/100g as rcvd	0.97
pH	pH Units	8.4
Total Aluminium	g/m ³	1,270
Total Arsenic	g/m ³	0.027
Total Cadmium	g/m ³	0.020
Total Chromium	g/m ³	0.157
Total Cobalt	g/m ³	2.1
Total Iron	g/m ³	330
Total Lead	g/m ³	0.063
Total Magnesium	g/m ³	83
Total Manganese	g/m ³	33
Total Nickel	g/m ³	5.0
Total Sodium	g/m ³	4.4
Total Zinc	g/m ³	26
Chloride	g/m ³	8 #1
Nitrite-N	g/m ³	< 0.10
Nitrate-N	g/m ³	< 0.10
Nitrate-N + Nitrite-N	g/m ³	< 0.10
Sulphate	g/m ³	650

Analyst's Comments

#1 Due to the nature of this sample a dilution was performed prior to analysis, resulting in a detection limit higher than that normally achieved for the Cl analysis.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1
pH	pH meter. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1



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Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Aluminium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.063 g/m ³	1
Total Arsenic	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1
Total Cadmium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0011 g/m ³	1
Total Chromium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1
Total Cobalt	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0042 g/m ³	1
Total Iron	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1
Total Lead	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0021 g/m ³	1
Total Magnesium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1
Total Manganese	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1
Total Nickel	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1
Total Sodium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1
Total Zinc	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser, screen level. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser, screen level. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1

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

Testing was completed between 25-Oct-2024 and 30-Oct-2024. 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.

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Sample Type: Aqueous

Sample Name:		T18c2 P1 24H Supernatant 22-Oct-2024 11:43 am	Whareatea Raw 22-Oct-2024 2:00 pm	MSR Raw 22-Oct-2024 2:00 pm
Lab Number:		3699791.1	3699791.2	3699791.3
Turbidity	NTU	1.90	0.29	0.06
pH	pH Units	7.7	4.8	8.1
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.1	5	< 1.1
Acidity (pH 7.0)	g/m ³ as CaCO ₃	1.3	10	< 1.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	< 1.0	5	2.2
Total Alkalinity	g/m ³ as CaCO ₃	13.6	1.2	105
Free Carbon Dioxide	g/m ³ at 25°C	< 1.0	37	1.7
Total Hardness	g/m ³ as CaCO ₃	620	3.7	220
Total Suspended Solids	g/m ³	4	< 4	< 3
Total Solids (TS)	g/m ³	970	< 30 #1	< 300 #1
Dissolved Aluminium	g/m ³	0.67	0.119	0.050
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00028
Dissolved Calcium	g/m ³	210	0.41	83
Dissolved Chromium	g/m ³	0.0011	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0060	0.0012	0.0062
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	0.08	< 0.02
Dissolved Lead	g/m ³	< 0.00010	0.00013	< 0.00010
Dissolved Magnesium	g/m ³	22	0.65	2.0
Dissolved Manganese	g/m ³	0.64	0.0086	0.0030
Dissolved Nickel	g/m ³	0.022	0.0018	0.072
Dissolved Zinc	g/m ³	0.0011	0.0123	0.48
Chloride	g/m ³	6.7	3.8	3.2
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	0.005	< 0.002	0.24
Nitrate-N + Nitrite-N	g/m ³	0.005	< 0.002	0.24
Sulphate	g/m ³	700	4.5	112
Dissolved Organic Carbon (DOC)	g/m ³	0.7	3.3	< 0.5
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.149	0.007
Transmittance at 254 nm*	%T, 1 cm cell	98.7	71.0	98.3

Analyst's Comments

#1 Due to the insufficient volume of this sample provided, it was not possible to add the usual volume for the Total Solids analysis. As the volume added was less than usual, the detection limit achieved and the analytical variation is greater than normal.



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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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-3
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 5.5)	Titration to pH 5.5 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Acidity (pH 7.0)	Titration to pH 7.0 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Free Carbon Dioxide	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D : Online Edition.	1.0 g/m ³ at 25°C	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-3
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-3
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 23-Oct-2024 and 31-Oct-2024. 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.

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APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE

AR-24-NW-046418-01

REPORT DATE

05/08/2024

Contact for your orders:

Contract:

Submission Reference:

Contract for Graymont (NZ) Limited
Mak Oxd

Order code:

EUNZWE-00196988

Purchase Order Number:

1017166

SAMPLE CODE

812-2024-00109651

Sample Name

Makareao Oxide 13-17/7

Sample Reference

Makareao Oxide

Reception Date & Time:

02/08/2024 9:30

Analysis Started on:

03/08/2024

Analysis Ending Date:

05/08/2024

Product Type

Quicklime

Sampled Date & Time

30/07/2024 00:00

Sampler(s)

CUSTOMER

RESULTS

LOQ

NW499 Arsenic - Total

Arsenic (As)

0.34

mg/kg

0.05

NW504 Cadmium - Total

Cadmium (Cd)

0.64

mg/kg

0.01

NW507 Chromium - Total

Chromium (Cr)

8.8

mg/kg

0.2

NW509 Copper - Total

Copper (Cu)

1.3

mg/kg

0.3

NW511 Lead - Total

Lead (Pb)

0.5

mg/kg

0.1

NW515 Mercury - Total

Mercury (Hg)

<0.1

mg/kg

0.1

NW517 Nickel - Total

Nickel (Ni)

1.2

mg/kg

0.2

LIST OF METHODS

NW499 Arsenic - Total: APHA Online Edition 3125 B mod.

NW504 Cadmium - Total: APHA Online Edition 3125 B mod.

NW507 Chromium - Total: APHA Online Edition 3125 B mod.

NW509 Copper - Total: APHA Online Edition 3125 B mod.

NW511 Lead - Total: APHA Online Edition 3125 B mod.

NW515 Mercury - Total: APHA Online Edition 3125 B mod.

NW517 Nickel - Total: APHA Online Edition 3125 B mod.

Signature

Phone

www.eurofins.co.nz



Food & Water Testing

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received.

Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

This document can only be reproduced in full.

The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT



SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15

New Zealand Supplier:
 Address:

Telephone:

Emergency No:
Website:

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

Disclaimer

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use

Supplier:

[REDACTED]

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.
Product Code: 1065 (Bulk) *These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/7

BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

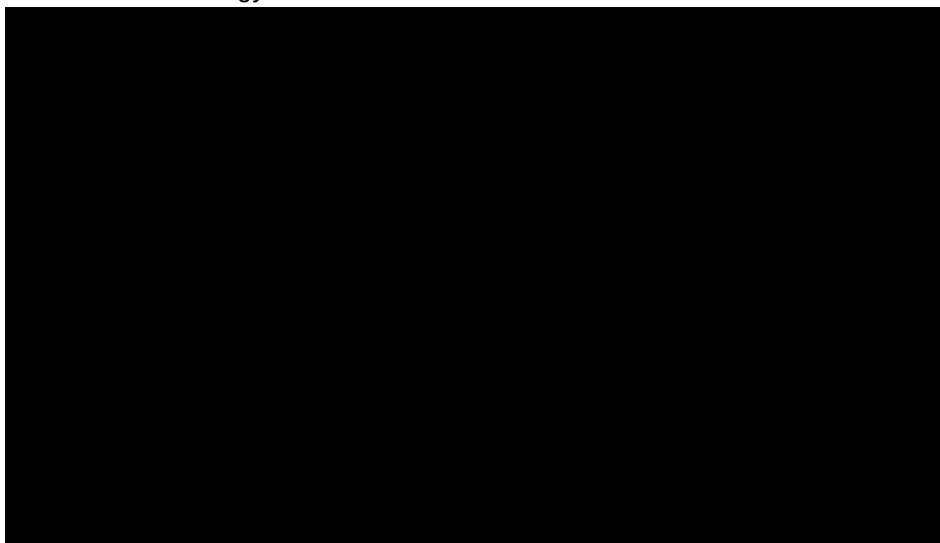
(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier



2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation.

Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet

Company:

BASF SE
67056 Ludwigshafen
GERMANY

Contact address:

BASF plc
PO Box 4, Earl Road, Cheadle Hulme,
Cheadle, Cheshire
SK8 6QG, UNITED KINGDOM

Telephone: +44 161 485-6222

E-mail address: product-safety-north@basf.com

Emergency telephone number

International emergency number:

Telephone: +49 180 2273-112

2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Melting point:	The substance / product decomposes therefore not determined.
Flash point:	not applicable
Solubility in water:	Forms a viscous solution.
Fire promoting properties:	not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:	No corrosive effect on metal.	
Formation of flammable gases:	Start temperature:	220 °C

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet

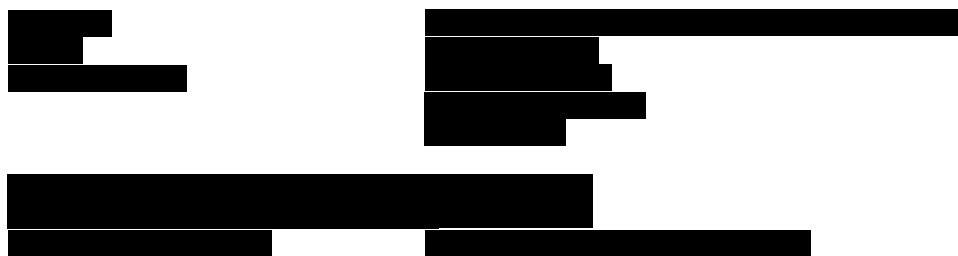


1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]

For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state

Solid

Appearance

No information available.

Color

White to Pink

Odor

Slight

Odor threshold

No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDSL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: SUPERFLOC B SERIES

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride . Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix D – Sludge Thickening and Dewatering Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	25/03/2026
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1 AMD SLUDGE PROCESSING, THICKENING AND DEWATERING

The residual byproduct of the proposed AMD treatment process will be lamella clarifier underflow containing residual sludge.

To reduce sludge volumes, sludge thickening and dewatering processes are being considered for treatment. Sludge thickening, Dewatering processes have been simulated at bench scale and are discussed here.

Sludge dewatering testing has been performed from December 2024 to March 2025 at Process Flow's premises in Nelson. Further to previous testing performed in report PFL-2408-PRO-RPT-000002, Acid Mine Drainage water was used to simulate the treatment process, on a larger scale than bench or column testing, to create volumes of sludge for use in sludge dewatering testing. The initial creation of sludge for use in further thickening and dewatering testing was produced using the following method.

1.1 Bulk Sludge Creation in Bulk Barrel 175 litre AMD Treatment

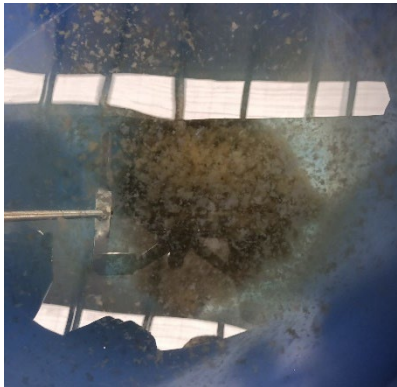
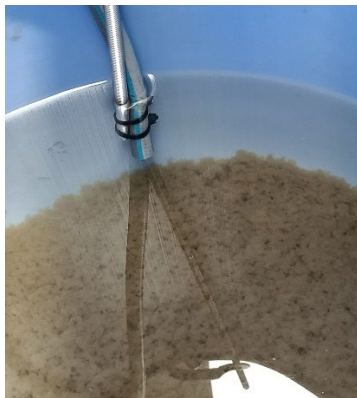
To create bulk sludge for testing, new sample water from Manchester St and S23 site was gathered on the 16th January 2025. On the 30th and 31st of January 2025 Bulk AMD treatment was performed on 10 x 175 litres batches.

PROCESS PARAMETERS FOR BULK AMD TREATMENT	QUANTITIES	UNITS
Treatment Barrel	175	L
Barrel Height of Water	700	mm
Barrel Diameter	430	mm
Slurry Makeup CaO, 5L with 5 x 200g CaO (i.e. 1kg)	20	%
Chemical Dose required per Barrel of S23 (based on previous dosing)		
CaO	796	mL
Metalsorb 0.1% soln	437.5	mL
Rheomax 0.1% soln (1g/1L)	525	mL
Chemical Dose required per Barrel Manchester St NEW (based on previous dosing)		
CaO	230	mL
Metalsorb 0.1% soln	355	mL
Rheomax 0.1% soln (1g/1L)	267	mL

1.1.1 Method

1. Barrel prewashed with Pyroneg plus tap water rinse plus sample rinse
2. All chemicals made up with DI water
3. Rapid mix 300RPM (Barrel mixer max speed)
4. Slow mix 30RPM manual
5. Lime in at Rapid mix 300RPM
6. Neutralisation 20mins.
7. Take pH at start and end of Neutralisation step
8. Add Metalsorb and Rapid Mix 1min
9. Add Rheomax and Rapid Mix 1 min
10. Slow mix 10 mins
11. Settle 30mins - do not move barrel
12. Decant: siphon supernatant down taking approximately 10L litres out,
Siphon down to surface of sludge and drain sludge into sludge sample bucket.

Run1 Manchester out of 175L of water, produced approximately 5L sludge. Accurate sludge volumes were not measured as part of this work; they have been documented in previous column testing work.

MANCHESTER ST SLOW MIX FLOCCULATION STAGE	SETTLED SLUDGE	SYPHONING SUPERNATANT
Test 2 	Test 2 	Test 2 

MANCHESTER ST SLOW MIX FLOCCULATION STAGE	SETTLED SLUDGE	SYPHONING SUPERNATANT
Test 3 	Test 6 	

BARREL TEST SUPERNATANTS – BEST VISUALLY

Manchester St from Test 1, Test 3, Test 4 and Test 5 left to right below.



S23 START OF SLOW MIX FLOCCULATION STAGE	SETTLED SLUDGE	SYPHONING SUPERNATANT
 Test 8	 Test 8	 Test 8

The treatment process parameters used to create sludge samples are as follows. Neutralent dosing varied depending on pH.

Table 1 Sludge Creation Barrel Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

	DESCRIPTION	UNIT	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5
	Sample		Manchester New				
	Date		30.1.25	30.1.25	30.1.25	30.1.25	30.1.25
	Raw Water pH	pH	3.17	3.1	3.2	3.26	3.2
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20	20
	Slurry amount	mL	230	230	280	230	210
	Neutralent Dose	mg/L	263	263	320	263	240
	Rapid Mix Speed	rpm	350	350	350	350	350
	Rapid Mix Time	min	20	20	20	20	20
	Final pH after Neutralisation	pH	10.32	8.43	10.5	8.43	10
Coagulant /Chelant Addition	Coagulation/ Chelation chem		Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	355	355	355	355	355
	Coag dose	mg/L	2	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350	350
	Rapid Mix Time	min	1	1	1	1	1
Flocculant Addition	Flocculant/Polymer		Rheomax 1050	Rheomax 1050	Rheomax 1050	Rheomax 1050	Rheomax 1050
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	267	267	267	267	267
	Floc/Poly dose	mg/L	1.5	1.5	1.5	1.5	1.5
	Rapid Mix Speed	rpm	350	350	350	350	350
	Rapid Mix Time	min	1	1	1	1	1
Flocculation Stage	Slow Mix Speed	rpm	30	30	30	30	30
	Slow Mix Time	min	10	10	10	10	10
	pH after slow mix	pH	10.55	8.9	10.5	10.1	
Settling Stage	Settling Cylinder/Jar		Settling over 30 mins	Settling over 30 mins	Settling over 30 mins	Settled in the first 1-2 mins	Settled in the first 1-2 mins

	DESCRIPTION	UNIT	TEST 6	TEST 7	TEST 8	TEST 9	TEST 10
	Sample		Manchester -New	Manchester -OLD	S23 New	S23 New	S23 New
	Date		31.1.25	31.1.25	31.1.25	31.1.25	31.1.25
	Raw Water pH	pH	3.3	3.17	2.75	2.77	2.77
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	CaO	CaO
	Concentration of slurry	%	20	20	20	20	20
	Slurry amount	mL	200	250	1000	1050	1100
	Neutralent Dose	mg/L	227	286	1143	1200	1257
	Rapid Mix Speed	rpm	350	350	350	350	350
	Rapid Mix Time	min	20	20	20	20	20
	Final pH after Neutralisation	pH	9.2	9.5	6.73	6.72	7.85
Coagulant /Chelant Addition	Coagulation/ Chelation chem		Metalsorb	Metalsorb	Metalsor b	Metalsor b	Metalsor b
	Coag Conc	%	0.1%	0.1%	0.1%	0.1%	0.1%
	Coag amount	mL	355	355	355	355	355
	Coag dose	mg/L	2	2	2	2	2
	Rapid Mix Speed	rpm	350	350	350	350	350
	Rapid Mix Time	min	1	1	1	1	1
Flocculant Addition	Flocculant/Polymer		Rheomax 1050	Rheomax 1050	Rheoma x 1050	Rheoma x 1050	Rheoma x 1050
	Floc/Poly Conc	%	0.1%	0.1%	0.1%	0.1%	0.1%
	Floc/Poly amount	mL	267	267	267	267	267
	Floc/Poly dose	mg/L	1.5	1.5	1.5	1.5	1.5
	Rapid Mix Speed	rpm	350	350	350	350	350
	Rapid Mix Time	min	1	1	1	1	1
Flocculatio n Stage	Slow Mix Speed	rpm	30	30	30	30	30
	Slow Mix Time	min	10	10	10	10	10
Settling Stage	Settling Cylinder/Jar		Settling over 30 mins	Settling over 30 mins	Settling over 30 mins	Settling over 30 mins	Settling over 30 mins

The sludge from Test 2 with pH 8.9 and Test 6 with pH 9.2 were mixed and used for the Manchester St Sludge Testing.

The sludge from Test 10 was used for the S23 testing.

1.1.2 Results

Supernatant, Sludge chemical and water quality results are presented as follows.

- Table 2 presents the mix/test parameters for sludge creation associated with each test
- Table 3 presents supernatant water quality for each sludge test
- Figure 1. Shows S23 sludge properties in mg/kg
- Figure 2. Shows S23 sludge properties in g/m³
- Figure 3. Shows Man sludge properties in g/m³

1.1.2.1 Supernatant Quality Test Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 2 Sludge Creation Barrel Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan- 2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	For Comparison T14S2-MAN 26- Aug-2024 4:00 pm
Hills Lab Number:		3839045.1	3839045.2	3839045.3	3839045.4	3839045.5	3668046.3
Sample		Manchester st	Manchester St New	Manchester St New	Manchester St New	New S23	Manchester st
Neutralent		CaO	CaO	CaO	CaO	CaO	CaO
Dose							1.3mg/l
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb		Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax	Rheomax	Rheomax	Rheomax
Sediment added		None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	minutes	20	20	20	20	20	20
Rapid Mix time for coagulant addition		1	1	1	1	1	1
Rapid Mix time for coagulant addition		1	1	1	1	1	1
Slow Mix Time	minutes	10	10	10	10	10	10
Settling Time		30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bench Jar 1 Litre

Table 3 Supernatant Water Quality Results Sludge Creation Barrel Tests

PF Test Identifier and Date Sent for Analysis		Manchester St OLD Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16 01 25	Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	16.8	1.08	3.2	2.1	1.23	1.59	12.8	0.86
Turbidity Target	NTU				5	5	5	5	5	5
pH	pH	3.2	3.1	2.6	8	7.9	10.9	9.7	7.4	7.7
pH Target	pH				4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3*	<1	< 1.0	< 1.0	17.8	14.8	102	48	15.5	14.7
Total Hardness	g/m3*	270	197	1,110	620	510	580	520	1930	630
EC	mS/m	114.4	103.7	381						
TSS	g/m3	<70	17	5	26	9	6	15	118	5
TSS Target	g/m3				5	5	5	5	5	58
Dissolved Aluminium	g/m3	51	46	220	1.5	1.67	14.9	7.7	0.096	0.93
Dissolved Aluminium Chronic GV 95%	g/m3				0.28	0.24	0.34	0.30	0.26	0.48
Dissolved Aluminium Chronic GV 90%	g/m3				0.35	0.30	0.43	0.38	0.33	0.61
Dissolved Aluminium Chronic GV 80%	g/m3				0.48	0.42	0.58	0.52	0.45	0.83
Dissolved Cadmium	g/m3	0.00081	0.00082	0.0037	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3				0.00037	0.00037	0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3				0.00069	0.00069	0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3				0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	53	199	230	183	230	210	600	220
Dissolved Chromium	g/m3	0.0051	0.0042	0.107	0.0013	0.0009	0.0013	0.0012	0.0041	< 0.0005
Dissolved Cobalt	g/m3	0.094	0.085	0.36	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002	0.0026
Dissolved Cobalt Chronic GV 95%	g/m3				0.0033	0.0033	0.0033	0.0033	0.0033	0.0033

PF Test Identifier and Date Sent for Analysis		Manchester St OLD Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16 01 25	Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Dissolved Cobalt Chronic GV 90%	g/m3				0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3				0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	0.0148	0.084	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3				0.0008	0.0007	0.0008	0.0007	0.0009	0.0016
Dissolved Copper Chronic GV 90%	g/m3				0.0010	0.0009	0.0010	0.0009	0.0011	0.0020
Dissolved Copper Chronic GV 80%	g/m3				0.0016	0.0014	0.0016	0.0014	0.0018	0.0032
Dissolved Iron	g/m3	13.2	3.5	170	0.02	0.02	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3				1.0	1.0	1.0	1.0	1.0	1.0
Dissolved Lead	g/m3	0.00136	0.00159	< 0.0010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	15.6	150	12.8	13.4	0.08	0.56	107	22
Dissolved Manganese	g/m3	1.99	1.41	11.6	0.0018	0.158	0.0005	0.0005	0.31	0.49
Dissolved Manganese Chronic GV 95%	g/m3				1.22	1.12	1.18	1.13	1.25	1.22
Dissolved Manganese Chronic GV 90%	g/m3				1.87	1.72	1.82	1.74	1.93	1.88
Dissolved Manganese Chronic GV 80%	g/m3				3.05	2.81	2.97	2.84	3.15	3.07
Dissolved Nickel	g/m3	0.23	0.2	1.02	< 0.0005	0.0032	< 0.0005	< 0.0005	0.0009	0.0115
Dissolved Nickel Chronic GV 95%	g/m3				0.099	0.099	0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3				0.118	0.118	0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3				0.154	0.154	0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	0.99	5.8	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

PF Test Identifier and Date Sent for Analysis		Manchester St OLD Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16 01 25	Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Dissolved Zinc Chronic GV 95%	g/m3				0.036	0.036	0.033	0.031	0.062	0.067
Dissolved Zinc Chronic GV 90%	g/m3				0.053	0.054	0.049	0.046	0.092	0.100
Dissolved Zinc Chronic GV 80%	g/m3				0.091	0.092	0.084	0.078	0.158	0.172
DOC	g/m3		0.8	1.1	0.6	< 0.5	0.6	< 0.5	0.7	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.109	6.31	0.006	0.013	0.004	0.015	0.014	0.013
Transmittance at 254 nm (1 cm cell)	%T,	30.3			98.5	97.1	99.1	96.6	96.8	97.1
Iron + Manganese		15.19	4.91	181.6	0.0218	0.178	0.0205	0.0205	0.33	0.51
Dissolved Iron + Manganese Chronic GV 80%/90%/95%					2.22	2.12	2.18	2.13	2.25	2.22

*as CaCO₃

1.1.2.2 Sludge Quality Tests Results

Sludge quality was tested to determine metal content and dry matter. (S23 results are depicted as mg/kg and converted to mg/l on the following page). Test 2/6 was a sludge sample showing expected sludge quality for Manchester st sample location, and Test 10 shows expected sludge quality for S23 sample location.

Figure 1 Sludge Results for S23 Barrel Test 10 Sludge - Raw Laboratory Results mg/kg dry wt

SAMPLE TYPE: SLUDGE T10 S23 – PRE THICKENING/DEWATERING – RESULTS IN MG/KG		
	Sample Name:	S23 (New) Test ID Sludge 31-Mar-2025
	Lab Number:	3842877.1
Dry Matter	g/100g as rcvd	2.9
Total Recoverable Aluminium	mg/kg dry wt	110,000
Total Recoverable Arsenic	mg/kg dry wt	40
Total Recoverable Cadmium	mg/kg dry wt	2.3
Total Recoverable Chromium	mg/kg dry wt	57
Total Recoverable Cobalt	mg/kg dry wt	192
Total Recoverable Iron	mg/kg dry wt	91,000
Total Recoverable Lead	mg/kg dry wt	0.5
Total Recoverable Magnesium	mg/kg dry wt	23,000
Total Recoverable Manganese	mg/kg dry wt	5,400
Total Recoverable Nickel	mg/kg dry wt	530
Total Recoverable Sodium	mg/kg dry wt	148
Total Recoverable Zinc	mg/kg dry wt	3,000
Chloride	mg/kg dry wt	340
pH	pH Units	8.44
Nitrite-N	mg/kg dry wt	< 17
Nitrate-N	mg/kg dry wt	28
Nitrate-N + Nitrite-N	mg/kg dry wt	28

SAMPLE TYPE: SLUDGE T10 S23 – PRE THICKENING/DEWATERING – RESULTS IN MG/KG

Sulphate	mg/kg dry wt	17,700
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Figure 2 Sludge Results for S23 Barrel Test 10 Sludge - converted to g/m3

SAMPLE TYPE: SLUDGE T10 S23 – PRE THICKENING/DEWATERING – RESULTS IN G/M3		
	Sample Name:	S23 (New) Test ID Sludge 31-Mar-2025
	Lab Number:	3842877.1
Dry Matter	g/100g as rcvd	2.9
Total Recoverable Aluminium	g/m3	3190
Total Recoverable Arsenic	g/m3	1.16
Total Recoverable Cadmium	g/m3	0.0667
Total Recoverable Chromium	g/m3	1.653
Total Recoverable Cobalt	g/m3	5.568
Total Recoverable Iron	g/m3	2639
Total Recoverable Lead	g/m3	0.0145
Total Recoverable Magnesium	g/m3	667
Total Recoverable Manganese	g/m3	156.6
Total Recoverable Nickel	g/m3	15.37
Total Recoverable Sodium	g/m3	4.292
Total Recoverable Zinc	g/m3	87
Chloride	g/m3	9.86
pH	pH Units	8.44
Nitrite-N	g/m3	0.493
Nitrate-N	g/m3	0.812
Nitrate-N + Nitrite-N	g/m3	0.812
Sulphate	g/m3	513.3

Note: The S23 Sludge sample was analysed at the Laboratory as a solid, due to the higher solids content. To allow comparison with the other sludge results, the Lab results have been converted from mg/kg dry wt basis to g/m3 using the assumption that the density of the sludge is 1g/mL and the dry matter was 2.9%. Therefore $\text{g/m}^3 = \text{mg/L} = \text{mg/kg dry wt} \times 0.029$.

Figure 3 Sludge Results for Manchester Barrel Test 2/Test 6 Mix Sludge (g/m3)

SAMPLE TYPE: SLUDGE MANCHESTER T2/T6MIX – PRE THICKENING/DEWATERING		
	Sample Name:	Barrel T2/T6 Sludge Jan 25 Mix 31-Jan-2025
	Lab Number:	3839043.1
Dry Matter	g/100g as rcvd	0.28
Total Recoverable Aluminium	g/m3	750
Total Recoverable Arsenic	g/m3	< 0.021
Total Recoverable Cadmium	g/m3	0.0173
Total Recoverable Chromium	g/m3	0.089
Total Recoverable Cobalt	g/m3	1.49
Total Recoverable Iron	g/m3	173
Total Recoverable Lead	g/m3	Not Reported
Total Recoverable Magnesium	g/m3	67
Total Recoverable Manganese	g/m3	23
Total Recoverable Nickel	g/m3	3.4
Total Recoverable Sodium	g/m3	Not Reported
Total Recoverable Zinc	g/m3	16.5
Chloride	g/m3	3.5
pH	pH Units	8.9
Nitrite-N	g/m3	< 0.10
Nitrate-N	g/m3	< 0.10
Nitrate-N + Nitrite-N	g/m3	< 0.10
Sulphate	g/m3	550
Sulphate-S	g/m3	182

1.2 Solids Thickening Testing

1.2.1 Thickening Summary

To test for the best conditions for dewatering of the simulated WTP Lamella underflow sludge, Solids Thickening Testing was performed on both Manchester St Sludge (created from Barrel Tests 2 and 6) and from S23 Sludge (from Barrel Test 10).

Investigations included:

- Appropriate Polymer selection
- Polymer dose range trials,
- Mixing optimisation including speeds and times
- Settling trial
- Creating thickened sludge for use in dewatering tests

This testing was carried out on the 10th to the 12th of February 2025.

1.2.2 Thickened Sludge Settling Rates

The best settling rates for thickened sludge were:

Manchester St - 0.366m/hr with Rheomax 1050 dose 7.5mg/l

S23 – 0.098 m/hr with Rheomax 1030 dose 10mg/l.

S23 Thickened sludge settling was not as pronounced as compared to Manchester st, due to the bulk of material in the cylinders. It may be that settling is not required for water like S23 and this water could go straight to a dewatering process.

1.2.3 Thickening Sludge Settled Volume and Supernatant Recycle

For the representative mean water condition (Manchester St sample), settling of thickened sludge had settled more than S23, and will allow more removal and recycle of supernatant back to the start of the process at the thickening stage than S23, thus reducing sludge processing volumes at this stage. Settled sludge volumes for Manchester St ranged from 23% minimum to 93% maximum with an average of 52.7% of the original sludge volume. For S23 the settled sludge volume range was less, with minimum volume at 63.5%, maximum at 100% (no volume reduction) and average at 84.8%.

For Manchester St average settled thickened sludge supernatant percentage in testing available for recycle was 47.2%, with minimum 7 % and maximum 77%. For S23 this was average 15.2%, minimum 0% (no settling) and maximum 36.5%.

1.2.4 Summary of Dry matter %

Manchester Thickened Sludge range 0.6 – 1.34% (0.57% unthickened)
S23 Thickened Sludge range 1.81-2.60% (1.87% unthickened)

Manchester Gravity dewater range 2.88-3.33%
S23 Gravity dewater range 3.93-4.18%

Manchester Pressure dewater range 6.34-7.99%
S23 Pressure dewater range 7.74-8.21%

1.3 Thickening Methodology

The following thickening and settling tests were carried out using sludge from the AMD sludge creation barrel tests, T2 & T6 mixed (Manchester St) and Test 10 (S23).

Three thickening agents were tested:

1. Rheomax 1050, which is an anionic flocculant higher charge. This had also been used previously to create the AMD sludge in the barrel tests and has also been used in the treated water testing. (bench and column tests).
2. Rheomax 1030, this is a lower charge anionic flocculant. This is more frequently used in NZ so is likely to be slightly lower cost so hence was trialled to see if this lower cost alternative would still provide adequate sludge thickening.
3. Crystalfloc 610H was also trialled. This is currently being used at Stockton. We had also used this in our previous bench and column treatment testing in combination with Superfloc BX5 as a flocculant.

Seven thickening and settling tests were performed:

- Tests 1, 2, 3 & 4 were with AMD Barrel Test Sludge Manchester T2 & T6 mixed, which had pH of 8.4-8.5
- Tests 5,6,7 using AMD Barrel Test Sludge from S23 Test 10, which had a pH of 8.2-8.4. (This was pH7.85 immediately after neutralisation, but sludge pH had risen prior to sludge testing)

1.3.1 Equipment used:

- A Boltac Infinity Jar Stirrer and four 1 litres jars were used for rapid and slow mixing process phases.
- Four x 1 litre glass graduated cylinders were used for bench settling tests.
- Hanna Bench top pH Meter for pH measurement

1.3.2 Method:

- Two sludges were tested with the three different flocculants:
 - Manchester Sludge from Test 2 and Test 6 combined, from 31.01.2025 (created from Manchester St AMD sampled in 16.01.2025) and
 - S23 Sludge Test 10 created on 31.01.2025 (created from S23 AMD sampled on 16.01.2025).
- Flocculants were prepared to 0.1% solutions with Deionised water
- Flocculants used were:
 - Rheomax 1050 (Anionic polymer, PAC),
 - Rheomax 1030 (Anionic polymer, PAC),
 - Crystalfloc 610H (Anionic watersoluble polymer)
- Flocculant was added to 1L of AMD Sludge and mixed at 350RPM for 1min
- Slow mix was 10 mins at 20RPM
- The sludge mixture was then decanted to a 1 litre cylinder and settled for 30min
- Settled distances and settled volume of sludge were recorded
- Volume and weight of sludge was recorded after decanting to calculate density
- Supernatant was sampled for later analysis
- Thickened Sludge was kept for further analysis and Dewatering trials

1.4 Visual Record of Sludge Thickening and Settling Tests

The following visual records shows the test progression from thickening chemical addition, though mixing then settling for each thickening trial on Manchester St and S23 Sludge. All Floc doses are in mg/L unless other stated.

Figure 4 Sludge Thickening - Manchester with Rheomax 1050

SLUDGE THICKENING TEST 1 MANCHESTER T2&T6 MIX WITH RHEO 1050

FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

Sludge before Chemical Addition (350rpm)



20 seconds after Chemical Addition (350rpm) An unthickened sample of the same sludge was also retained (Right hand jar) and compared in settling tests and subsequent dewatering.



SLUDGE THICKENING TEST 1 MANCHESTER T2&T6 MIX WITH RHEO 1050

FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

Start of Slow Mix (30rpm)



Slow mix 2mins (30rpm)



FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

Slow Mix 5 mins (30rpm)



End of Slow Mix (10mins) – mixer still running at 30rpm



End of slow mix (10mins) – mixer off

It can be seen that Jar 4 with Dose 5mg/l is the only jar to distinctively thicken from this batch



SLUDGE THICKENING TEST 1 MANCHESTER T2&T6 MIX WITH RHEO 1050

FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

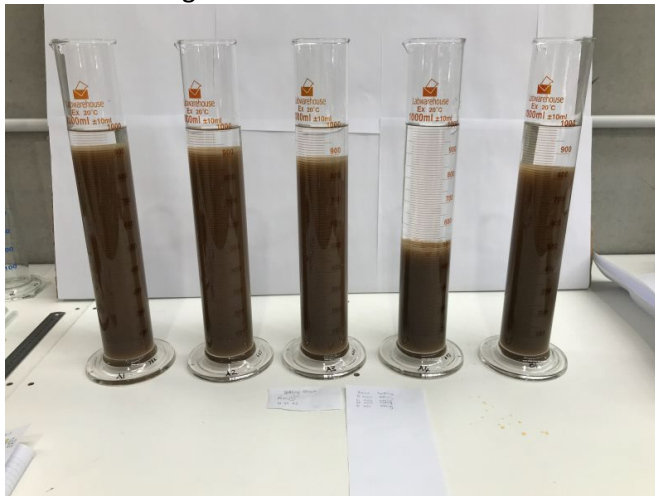
Start of Settling



5 mins Settling



30 mins Settling



Settling from Jar 4 (Dose 5mg/l) gave the best settling results. It appeared that the lower doses of flocculant were insufficient for thickening and settling.

SLUDGE THICKENING TEST 1 MANCHESTER T2&T6 MIX WITH RHEO 1050

FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

Sludge Thickening TEST 2 Manchester T2T6 Mix with Rheo 1050

Floc Doses: Jar 1= 4 Jar 2= 7.5 Jar 3= 10 Jar 4=15 mg/l

Start of test



After Chem addition 20sec



SLUDGE THICKENING TEST 1 MANCHESTER T2&T6 MIX WITH RHEO 1050

FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

Start of slow mix



Jar 2 (7.5 mg/l dose), Jar 3 (10 mg/l dose) and Jar 4 (15 mg/l dose) thickened rapidly at the start of the slow mix

10 mins slow mix (end)

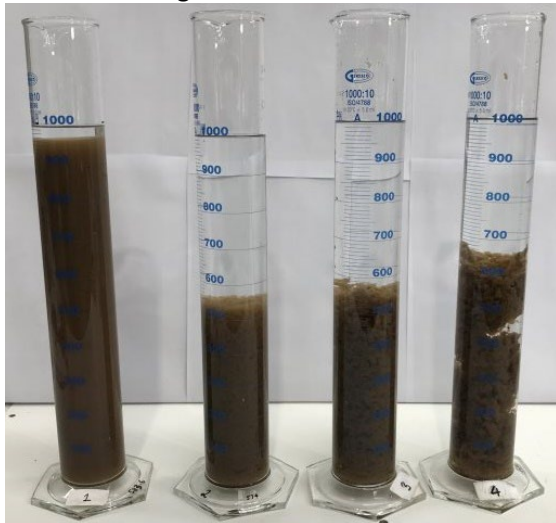


Jar 1 did thicken slightly after 10 minutes but not as much as Jars 2-4.

SLUDGE THICKENING TEST 1 MANCHESTER T2&T6 MIX WITH RHEO 1050

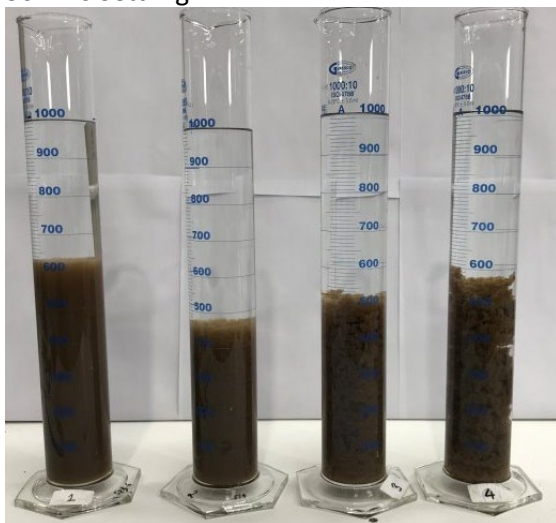
FLOC DOSES mg/L: JAR 1= 0.5 JAR 2= 1 JAR 3= 2 JAR 4=5 JAR 5 = BLANK (UNTHICKENED SLUDGE)

Start of Settling



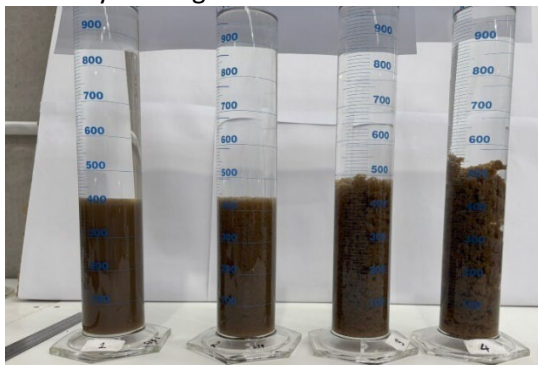
Initial settling was best for Jar 2 (7.5mg/l dose) settled rapidly

30mins Settling



After 30 minutes all jars had settled, but jars 3 and 4 had stalled due to thickened sludge bulk preventing further settling.

Next day settling



24 hour settling on Jars 1 and 2 provided more settling, but 3 and 4 had stalled .

Figure 5 Sludge Thickening - Manchester with Rheomax 1030

SLUDGE THICKENING RUN3 MANCHESTER T2T6 MIX WITH RHEO 1030

FLOC DOSES: JAR 1=2.5 JAR 2=5 JAR 3= 10 JAR 4=15 mg/L

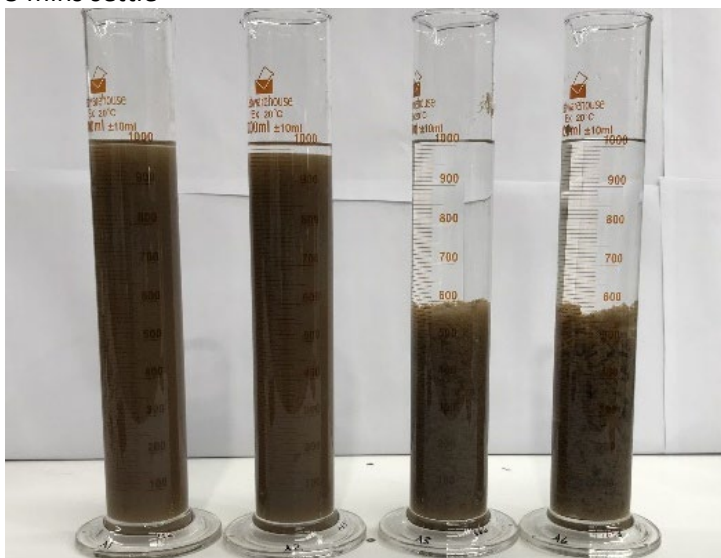
Start of slow mix



10 mins slow mix



5 mins settle



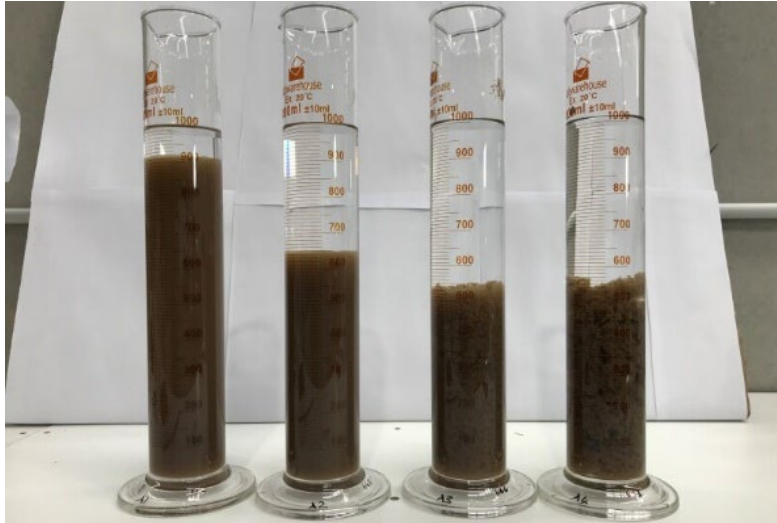
Jars 3 and 4 settled rapidly forming bulky sludge which did not settle further.

Jars 3 and 4 settled rapidly forming

SLUDGE THICKENING RUN3 MANCHESTER T2T6 MIX WITH RHEO 1030

FLOC DOSES: JAR 1=2.5 JAR 2=5 JAR 3= 10 JAR 4=15 mg/L

30 mins settle



Next Day settle

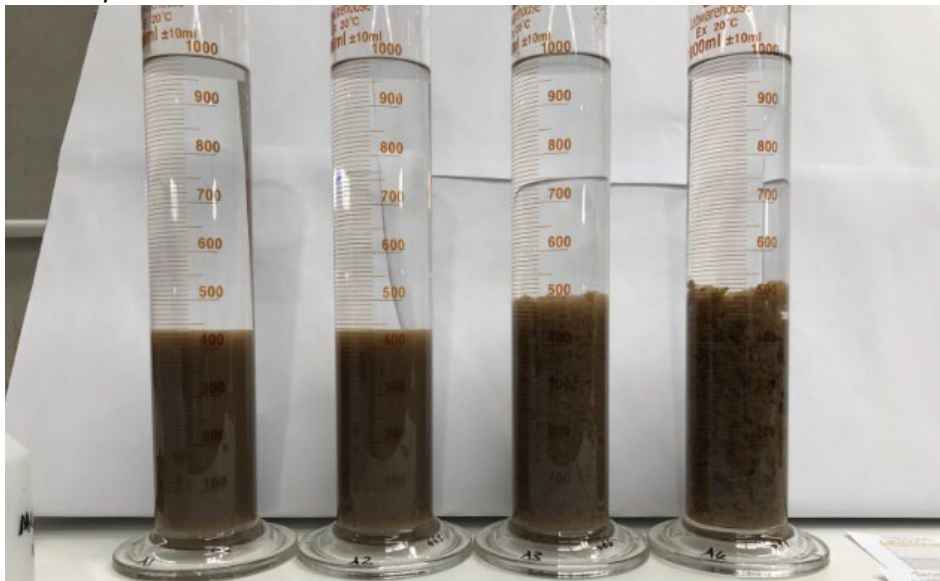


Figure 6 Sludge Thickening - Manchester with Crystalfloc 610H

TEST4 CRYSTALFLOC MAN

FLOC DOSES: JAR 1=2.5 JAR 2=5 JAR 3= 10 JAR 4=15 mg/L

Start of slow mix



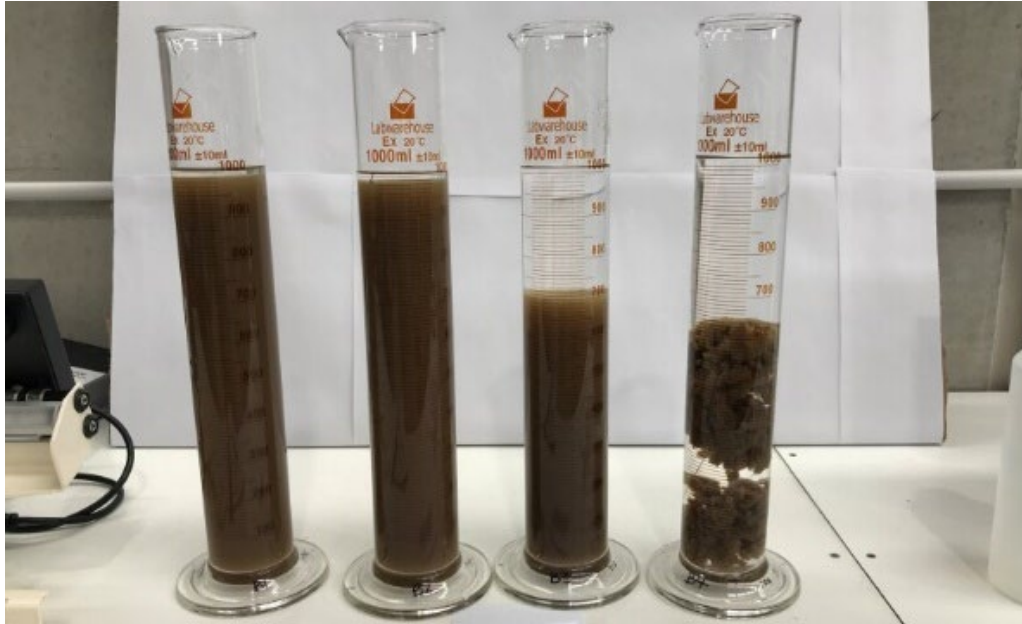
10 mins slow mix



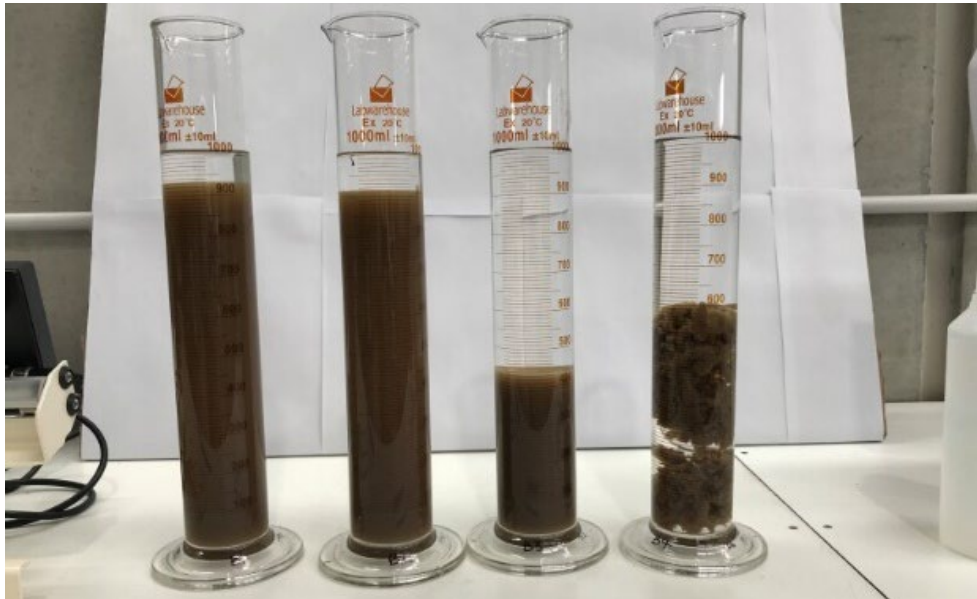
TEST4 CRYSTALFLOC MAN

FLOC DOSES: JAR 1=2.5 JAR 2=5 JAR 3= 10 JAR 4=15 mg/L

5 mins settle



30 mins settle



TEST4 CRYSTALFLOC MAN

FLOC DOSES: JAR 1=2.5 JAR 2=5 JAR 3= 10 JAR 4=15 mg/L

Next Day Settle



Figure 7 Sludge Thickening - S23 with Rheomax 1050

SLUDGE THICKENING TEST 5 RHEO 1050 S23

FLOC DOSES: JAR 1=30 JAR 2=20 JAR 3= 10 JAR 4=25 mg/L

Start of slow mix



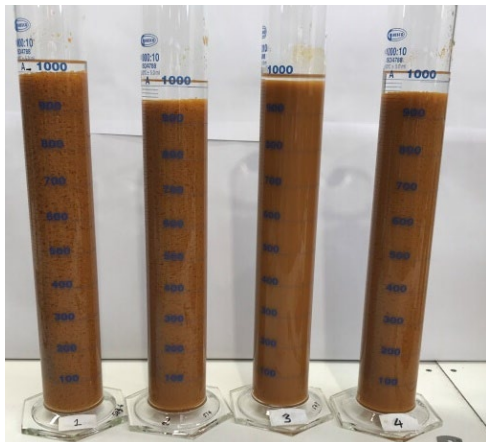
End of slow mix



SLUDGE THICKENING TEST 5 RHEO 1050 S23

FLOC DOSES: JAR 1=30 JAR 2=20 JAR 3= 10 JAR 4=25 mg/L

5 mins settle



30 mins settle



Figure 8 Sludge Thickening - S23 with Rheomax 1030

SLUDGE THICKENING TEST 6 RHEO 1030 S23

FLOC DOSES: JAR 1=15 JAR 2=20 JAR 3= 25 JAR 4=35 mg/L

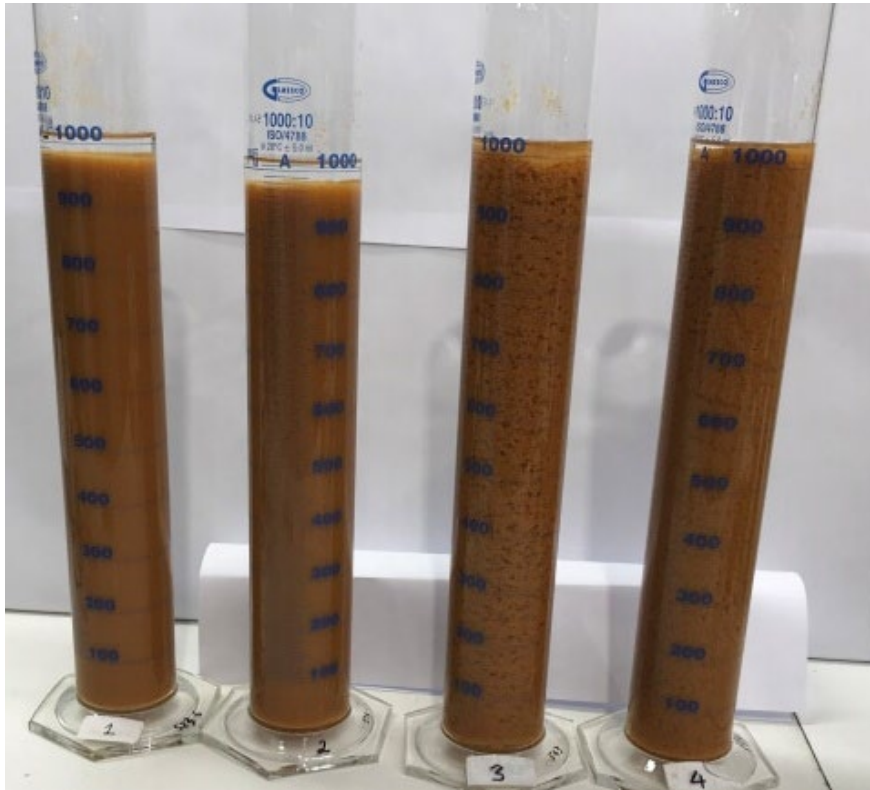
After Chem Addition (only had 30sec slow mix)



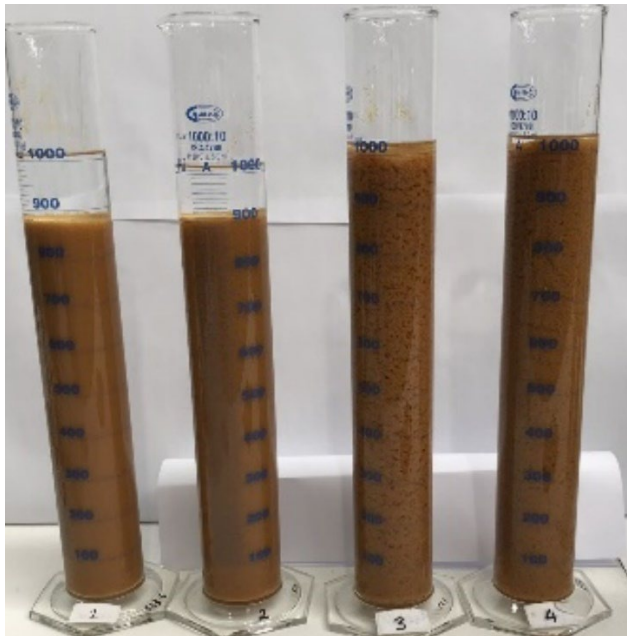
SLUDGE THICKENING TEST 6 RHEO 1030 S23

FLOC DOSES: JAR 1=15 JAR 2=20 JAR 3= 25 JAR 4=35 mg/L

5 mins settle



30 mins settle



SLUDGE THICKENING TEST 6 RHEO 1030 S23

FLOC DOSES: JAR 1=15 JAR 2=20 JAR 3= 25 JAR 4=35 mg/L

3 hrs settling

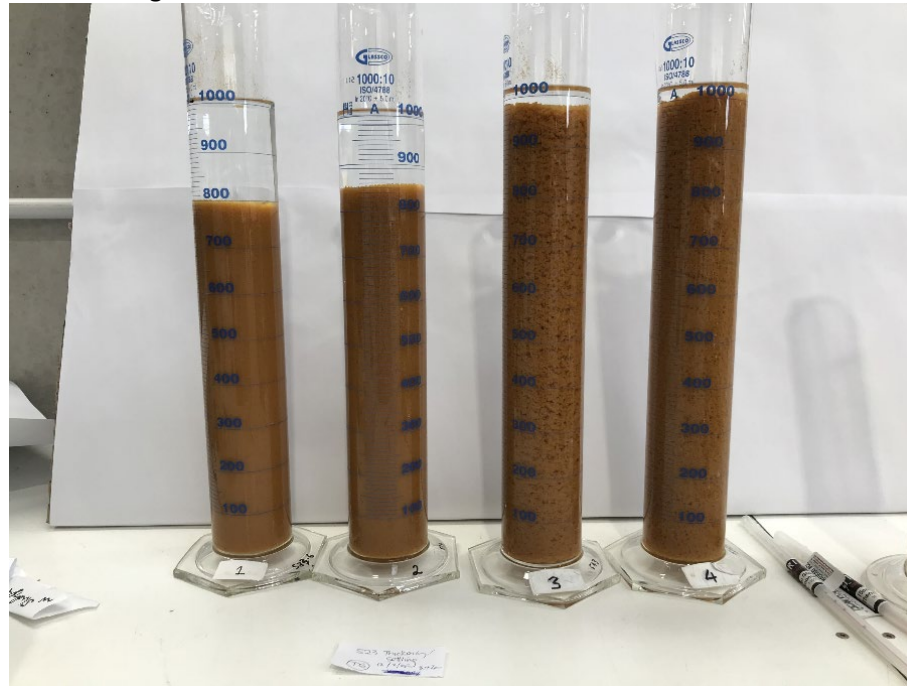


Figure 9 Sludge Thickening - S23 with CrystalFloc610H

SLUDGE THICKENING TEST 7 CRYSTALFLOC610H S23

FLOC DOSES: JAR 1=10 JAR 2=15 JAR 3= 20 JAR 4=30 mg/L

After Chem Addition



After Chem Addition (30sec Slow Mix)



5 mins settle



SLUDGE THICKENING TEST 7 CRYSTALFLOC610H S23

FLOC DOSES: JAR 1=10 JAR 2=15 JAR 3= 20 JAR 4=30 mg/L

30 mins settle



1.5 Thickening Results

Floc dose optimisation included trialling several doses for each thickening agent.

Flocculation and thickening occurred almost immediately during rapid mix for some combinations of chemical and dose rate. Some floc formation was rapidly formed but then broke up later, for example, in Test 5 (S23 with Rheomax1050) a floc formed in the rapid mix which broke up in the slow mix process.

We trialled this S23 sample with Rheomax1030 in Test 6 and reduced the rapid mix to 5 second and had a 30 second slow mix step rather than 10 minutes. This preserved the floc formation.

For the Manchester St sludge however, the 1-minute rapid mix and 10 minutes slow mix did not seem to break up the floc for most of the results, but with large floc breaking up at high doses of Rheomax1050 after 8 minutes.

After observation of the Manchester Rheomax 1030 we noted that for the 10 and 15 mg/l doses that it might be beneficial to reduce the rapid mix time to 30 seconds and slow mix 5 minutes.

Overall, for the full scale WTP we recommend that the mixing duration of both rapid and slow mix of thickening chemical addition have flexibility to reduce to anywhere from 5 seconds rapid mix and no slow mix and increase up to 1 min rapid mix and 10 mins or more slow mix.

Some sludges had good settling and supernatant removal ability at the thickening stage, whereas other sludges were bulky, less dense and did not settle well, but did dewater well in the gravity and pressure dewatering testing. Therefore, in the full scale WTP the variability to allow for settling and supernatant removal that might be needed for some sludge whereas, some sludge may not give any supernatant from the thickening process, and more water removal may be at the dewatering stage.

Table 4 Summary of Thickening, Settling and Dewatering results

Sample name	MANCHESTER ST NEW	MANCHESTER ST NEW	MANCHESTER ST NEW	S23 OLD	S23 OLD	S23 OLD
	Rheo 1050	Rheo 1030	Crystalfloc 610	Rheo 1050	Rheo 1030	Crystalfloc 610
Best Dose for best Settling Rate (g/m3)	7.5	10	10	25	10	15
Best Settling Rate (m/hr)	0.366	0.292	0.364	0.088	0.096	0.078
Range Wet Density of Sludge after thickening and settling g/L	405-951 (30 min settling)	993-1014 (24 hr settling)	956.5-1002.2 (24 hr settling)	1003.1-1010.9 (30 mins settling)	1004.3-1006.3 (24 hrs settling)	1002.8-1007.9 (24 hrs settling)
Thickened Sludge % Dry matter range	0.6-1.34	1.06-1.24	0.91-1.08	1.96-2.43	1.86-2.08	1.18-2.6
Gravity Dewater % Dry Matter Range	3.31	2.9-3.33	2.88-2.89	3.93-3.96	3.97-4.14	3.95-4.18
Pressure Dewater % Dry Matter Range	6.34-7.46	7.64	7.99	7.74-8.06	7.62-8.39	8.21

Note: Percentage Dry matter ranges in this table above are from a range of thickening doses, not all optimal.

1.5.1 Thickening Sludge Settled Volume and Supernatant Recycle

In the testing, after thickened sludge had settled, supernatant was decanted. The remaining sludge is subnatant to be further processed for dewatering.

The subnatant weight and volume were measured and used to calculate the wet density.

For the representative mean water condition (Manchester St sample), thickened sludge settled better than S23. This will allow more removal and recycle of supernatant back to the start of the treatment process at the thickening stage for Manchester St water than for S23 water, thus reducing sludge processing volumes at this stage of the process.

Settled sludge volumes for Manchester St ranged from 23% minimum to 93% maximum with an average of 52.7% of the original sludge volume. For S23 the settled sludge volume range was less, with minimum volume at 63.5%, maximum at 100% (no volume reduction) and average at 84.8%.

Table 5 Percentage Settled Sludge Volume in cylinders

% SETTLED SLUDGE VOLUME IN CYLINDER			
	Average % Sludge Volume	Minimum % Sludge Volume	Maximum % Sludge Volume
Manchester St	52.7	23	93
S23	84.8	63.5	100

1.5.2 Thickening Supernatant Recycle

For the representative mean water condition (Manchester St sample), because the better settling of thickened sludge compared to S23 water, higher supernatant volumes will be available for recycle. For Manchester St average settled thickened sludge supernatant percentage in testing available for recycle was 47.2%, with minimum 7 % and maximum 77%. For S23 this was average 15.2%, minimum 0% (no settling) and maximum 36.5%.

Table 6 Thickened Sludge Supernatant Recycle Results

THICKENED SLUDGE SUPERNATANT RECYCLE			
	Average % recycle	Minimum % recycle	Maximum % recycle
Manchester St	47.2	7.0	77.0
S23	15.2	0	36.5

Tables 7. Shows the process parameters used for sludge thickening trials and Table 8. presents the supernatant qualities for each thickening trial, this was to inform whether supernatant from the thickening process was suitable for direct discharge or whether it required recycling to the beginning of the water treatment process.

1.5.3 Sludge Thickening Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 7 Sludge Thickening Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Identifier and Date Sent for Analysis		Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	For Comparison T14S2-MAN 26-Aug-2024 4:00 pm
Hills Lab Number:		3839045.2	3839045.5	3841393.15	3841393.16	3841393.17	3841393.18	3668046.3
Sample		Manchester St New	New S23	Sludge from T2/T6 Mix Manchester New	Sludge from T2/T6 Mix Manchester New	Sludge from T10 S23 New	Sludge from T10 S23 New	Manchester st
Neutralent		CaO	CaO	None	None	None	None	CaO
Coagulant		Metalsorb	Metalsorb	None	None	None	None	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax1050 15mg/l	Crystalfloc610H 15mg/l	Rheomax1030 35mg/l	Crystalfloc610H 15mg/l	Rheomax
Sediment added		None	None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	mins	20	20	None	None	None	None	20
Rapid Mix time for coagulant addition	mins	1	1	None	None	None	None	1
Rapid Mix time for flocculant addition	mins	1	1	1	1	5 seconds	5 seconds	1
Slow Mix Time	mins	10	10	10	10	30 seconds	30 seconds	10
Settling Time		30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	Bulk Barrel 175 litres	1 litre	1 litre	1 litre	1 litre	Bench Jar 1 Litre

Table 8 Supernatant Water Quality Results Sludge Thickening Tests

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16.01.25	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	16.8	1.08	2.1	12.8	4.9	8.8	-	1.33	0.86
Turbidity Target	NTU				5	5	5	5	5	5	5
pH	pH	3.2	3.1	2.6	7.9	7.4	8	8.5	-	7.3	7.7
pH Target	pH				4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Alkalinity ##	g/m3	<1	< 1.0	< 1.0	14.8	15.5	14.5	20	-	15.7	14.7
Hardness ##	g/m3	270	197	1,110	510	1930	560	540	1,930	1,930	630
EC*	mS/m	114.4	103.7	381							
TSS***	g/m3	<70	17	5	9	118	-	-	-	-	5
TSS Target	g/m3				5	5	5	5	5	5	5
Aluminium #	g/m3	51	46	220	1.67	0.096	0.054	0.35	0.083	0.006	0.93
Aluminium Chronic GV 95%	g/m3				0.24	0.26	0.50	2.37	-	0.38	0.48
Aluminium Chronic GV 90%	g/m3				0.30	0.33	0.64	2.99	-	0.48	0.61
Aluminium Chronic GV 80%	g/m3				0.42	0.45	0.87	4.08	-	0.65	0.83
Cadmium #	g/m3	0.00081	0.00082	0.0037	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Cadmium Chronic GV 95%	g/m3				0.00037	0.00037	0.00037	0.00037	0.00037	0.00037	0.00037
Cadmium Chronic GV 90%	g/m3				0.00069	0.00069	0.00069	0.00069	0.00069	0.00069	0.00069

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16.01.25	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Cadmium Chronic GV 80%	g/m3				0.00155	0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Calcium #	g/m3	69	53	199	183	600	210	200	620	620	220
Chromium #	g/m3	0.0051	0.0042	0.107	0.0009	0.0041	0.0014	0.0018	0.0057	0.0059	< 0.0005
Cobalt #	g/m3	0.094	0.085	0.36	0.0007	< 0.0002	0.0002	< 0.0002	0.0015	0.0012	0.0026
Cobalt Chronic GV 95%	g/m3				0.0033	0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
Cobalt Chronic GV 90%	g/m3				0.0078	0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Cobalt Chronic GV 80%	g/m3				0.0208	0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Copper #	g/m3	0.0133	0.0148	0.084	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005
Copper Chronic GV 95%	g/m3				0.0007	0.0009	0.0016	0.0079	-	0.0014	0.0016
Copper Chronic GV 90%	g/m3				0.0009	0.0011	0.0019	0.0096	-	0.0017	0.0020
Copper Chronic GV 80%	g/m3				0.0014	0.0018	0.0030	0.0151	-	0.0027	0.0032
Iron #	g/m3	13.2	3.5	170	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Iron Chronic GV 80%/90%/95%	g/m3				1	1	1	1	1	1	1.0
Lead #	g/m3	0.00136	0.00159	< 0.0010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Magnesium #	g/m3	24	15.6	150	13.4	107	8.4	8	93	94	22
Manganese #	g/m3	1.99	1.41	11.6	0.158	0.31	0.0054	0.0043	0.31	0.33	0.49
Manganese Chronic GV 95%	g/m3				1.12	1.25	1.17	1.15	1.25	1.25	1.22

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	S23 New Raw Water Sample 16.01.25	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 10 S23 New Supernatant 31-Jan-2025	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Manganese Chronic GV 90%	g/m3				1.72	1.93	1.79	1.76	1.93	1.93	1.88
Manganese Chronic GV 80%	g/m3				2.81	3.15	2.92	2.88	3.15	3.15	3.07
Nickel #	g/m3	0.23	0.2	1.02	0.0032	0.0009	0.0008	0.0006	0.0016	0.0022	0.0115
Nickel Chronic GV 95%	g/m3				0.099	0.099	0.099	0.099	0.099	0.099	0.099
Nickel Chronic GV 90%	g/m3				0.118	0.118	0.118	0.118	0.118	0.118	0.118
Nickel Chronic GV 80%	g/m3				0.154	0.154	0.154	0.154	0.154	0.154	0.154
Zinc #	g/m3	1.11	0.99	5.8	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0014	0.0068	< 0.0010
Zinc Chronic GV 95%	g/m3				0.036	0.062	0.051	0.118	-	0.086	0.067
Zinc Chronic GV 90%	g/m3				0.054	0.092	0.077	0.177	-	0.128	0.100
Zinc Chronic GV 80%	g/m3				0.092	0.158	0.132	0.303	-	0.220	0.172
DOC	g/m3		0.8	1.1	< 0.5	0.7	1.5	15	-	1.3	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.109	6.31	0.013	0.014	0.007	0.01	-	0.019	0.013
Transmittance at 254 nm	%T, 1 cm cell	30.3			97.1	96.8	98.3	97.6	-	95.8	97.1
Iron + Mn #		15.19	4.91	181.6	0.178	0.33	0.0254	0.0243	0.33	0.35	0.51
Iron + Mn Chronic GV 80%/90%/95%					2.12	2.25	2.17	2.15	2.25	2.25	2.22

Dissolved Metals

*DOC – Dissolved Organic Carbon

**EC Electrical Conductivity

##Total, as CaCO3 ***TSS

1.5.3.1 Comment on thickened settled sludge supernatant quality

Settled thickened sludge supernatant compares well to previous AMD treated water, See Table 8: Barrel Test MAN Test 2, Barrel Test 10 S23 and T14S2 MAN (Jar test).

Samples from the Sludge thickening supernatants complied with the Modified Guideline Values for metals but didn't meet the treated targets for pH. One test met the metals GVs but didn't meet the treated target for pH and Turbidity. (Total suspended solids was not measured for in the thickening supernatants). The quality of these supernatants indicates that there could be a process option in the full scale WTP to add this supernatant to the discharge directly with the treated water, rather than recycling back to the influent AMD, if the TSS was acceptable.

1.5.4 Thickened Sludge Wet Densities

For the Manchester St Thickened Sludge Rheomax1050 produced a less dense sludge with increasing dose. Crystalfloc also decreased density at higher dose, with Rheomax1030, sludge densities increased as dosages increased. Results are presented in Figure 10 and Table 9. Although wet densities were not particularly high, settling of sludge did occur, allowing supernatant removal at the thickening stage. This is detailed further in the settling section of this report.

Figure 10 Manchester Sludge Thickening - Chemical Dose versus Wet Density

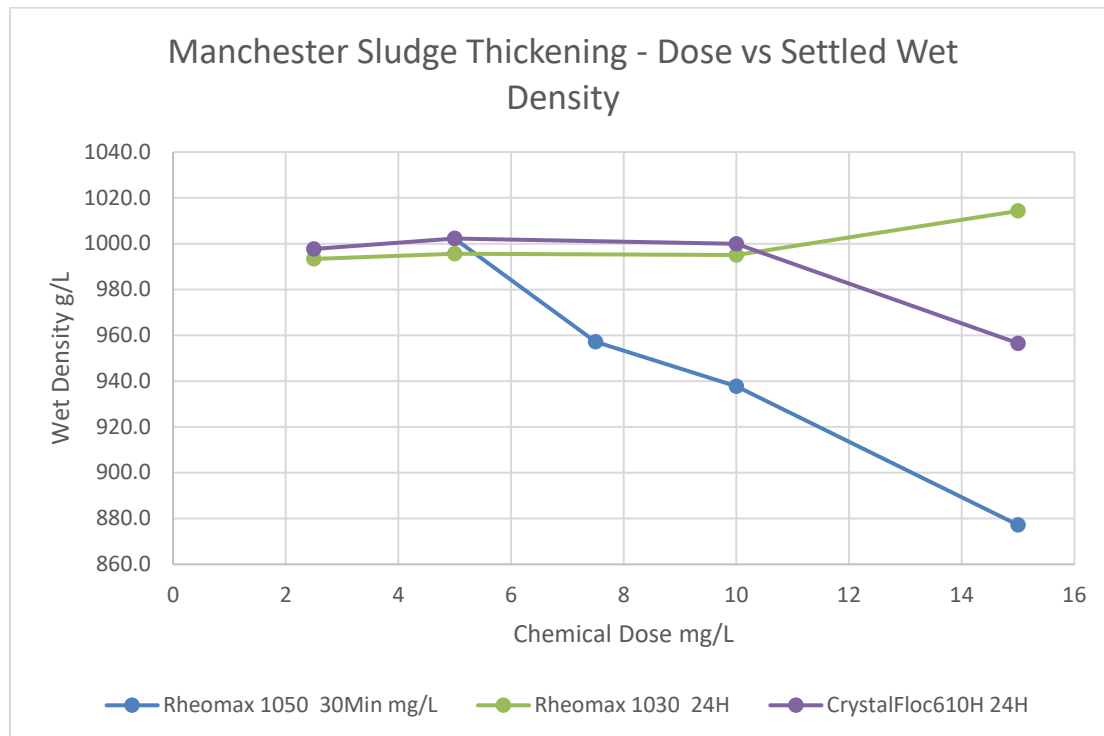


Table 9 Manchester Sludge Thickening - Dose versus Settled Wet Density

MANCHESTER SLUDGE THICKENING - DOSE VS SETTLED WET DENSITY					
Rheomax 1050 30Min	mg/L	5	7.5	10	15
Calculated Density of 30min Settled sludge in cylinder	g/l	951.0	853.0	546.7	405.4
Rheomax 1030 24H	mg/L	2.5	5	10	15
Calculated Density of next day after decant sludge in cylinder	g/l	993.3	995.6	995.1	1014.3
CrystalFloc610H 24H	mg/L	2.5	5	10	15
Calculated Density of next day after decant sludge in cylinder	g/l	997.7	1002.2	1000	956.5

For S23 Thickened Sludge, the results were mixed. The Rheomax1050 increased density with increased chemical dose, the Rheomax1030 did also, and the Crystalfloc was variable, possibly reaching its optimum dose at 20mg/l. Results are presented in Figure 11 and Table 10. The two Rheomax type may not have reached their optimum dose. Rheomax1050 showed the most promise, taking into account the small number of data points here.

Figure 11 S23 Sludge Thickening - Chemical Dose versus Wet Density

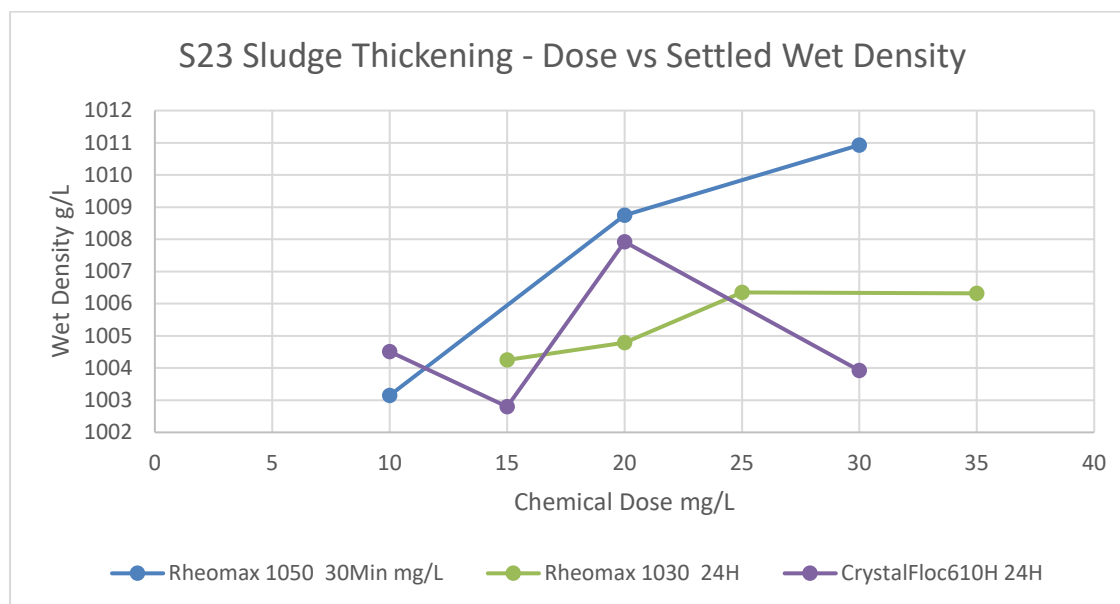


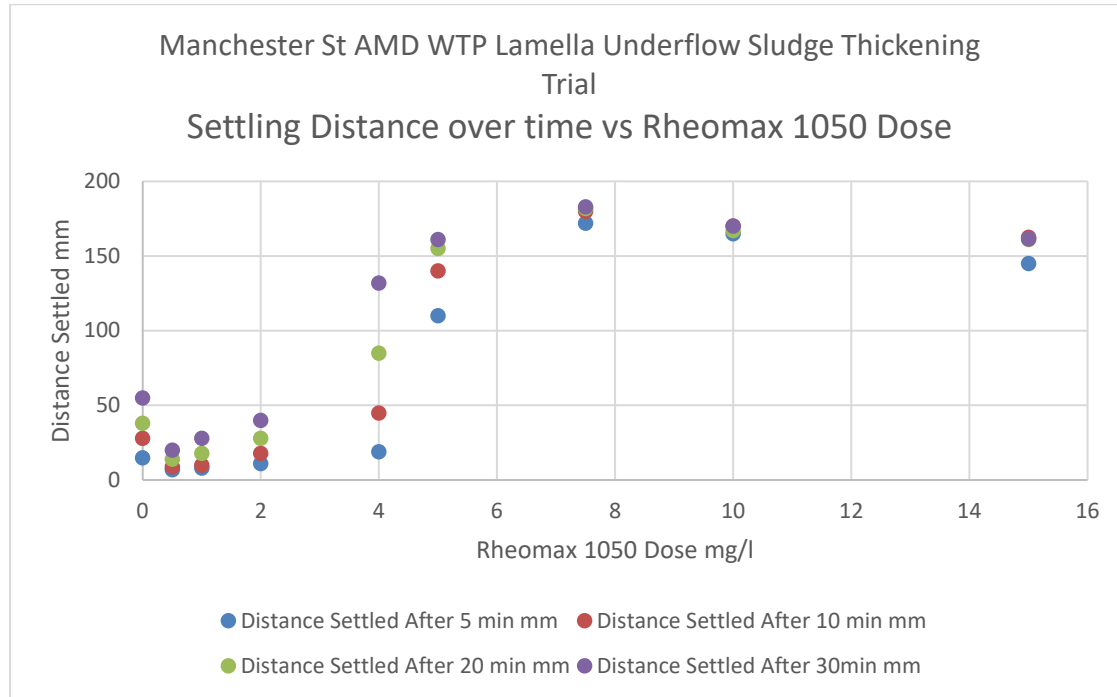
Table 10 S23 Sludge Thickening - Dose versus Settled Wet Density

S23 SLUDGE THICKENING - DOSE VS SETTLED WET DENSITY					
Rheomax 1050 30Min	mg/L	30	20	10	25
Calculated Density of 30min Settled sludge in cylinder	g/l	1010.9	1008.8	1003.1	
Rheomax 1030 24H	mg/L	15	20	25	35
Calculated Density of next day afterdecant sludge in cylinder	g/l	1004.3	1004.8	1006.3	1006.3
CrystalFloc610H 24H	mg/L	10	15	20	30
Calculated Density of next day afterdecant sludge in cylinder	g/l	1004.5	1002.8	1007.9	1003.9

1.5.5 Manchester St Settling after thickening

Figure 12 presents the thickened sludge settling distances for Manchester St, with the three chemicals trialled, Rheomax1050, Rheomax1030 and Crystalfloc610H.

Figure 12 Sludge Thickening - Settling Distance over time - Manchester AMD with Rheomax 1050



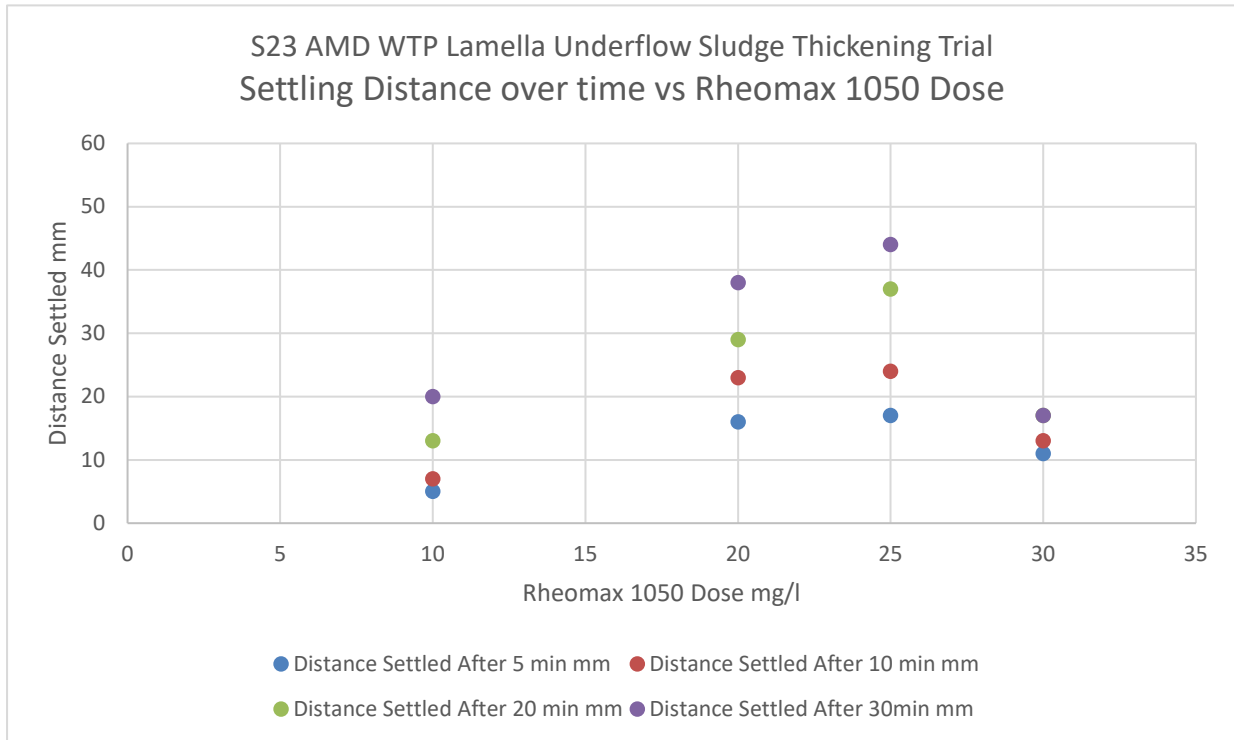
The best dose of Rheomax1050 for both 5 minutes and 30 minutes settling was 7.5mg/l. At 15 mg/l dose the sludge was bulky, did not settle well, was not as dense but did dewater well. So, although it took up a bulky space as a thickened sludge, the dewatering gave better dewatered sludge results.

In the full scale WTP there needs to be the flexibility of process settings to allow for variable amounts of settled sludge and supernatant removal. Higher settling and thus higher supernatant removal might be needed for some sludge whereas, some sludge may not give any supernatant from the thickening process and more water removal may be required at the dewatering stage.

1.5.6 S23 Settling after Thickening

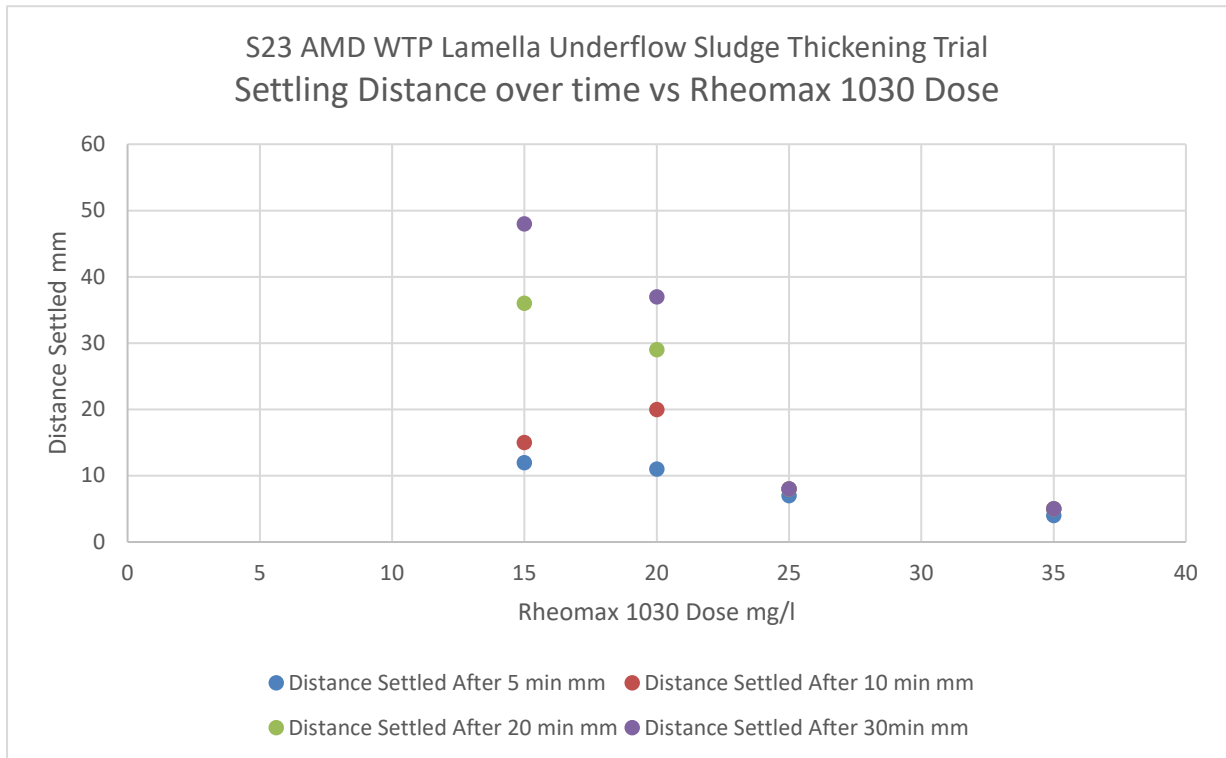
Figures 13 – 15 present graphs showing the results for the thickened sludge settling distances for S23, with the three chemicals trialled, Rheomax1050, Rheomax1030 and Crystalfloc610H.

Figure 13 Sludge Thickening - Settling Distance over time - S23 AMD with Rheomax 1050



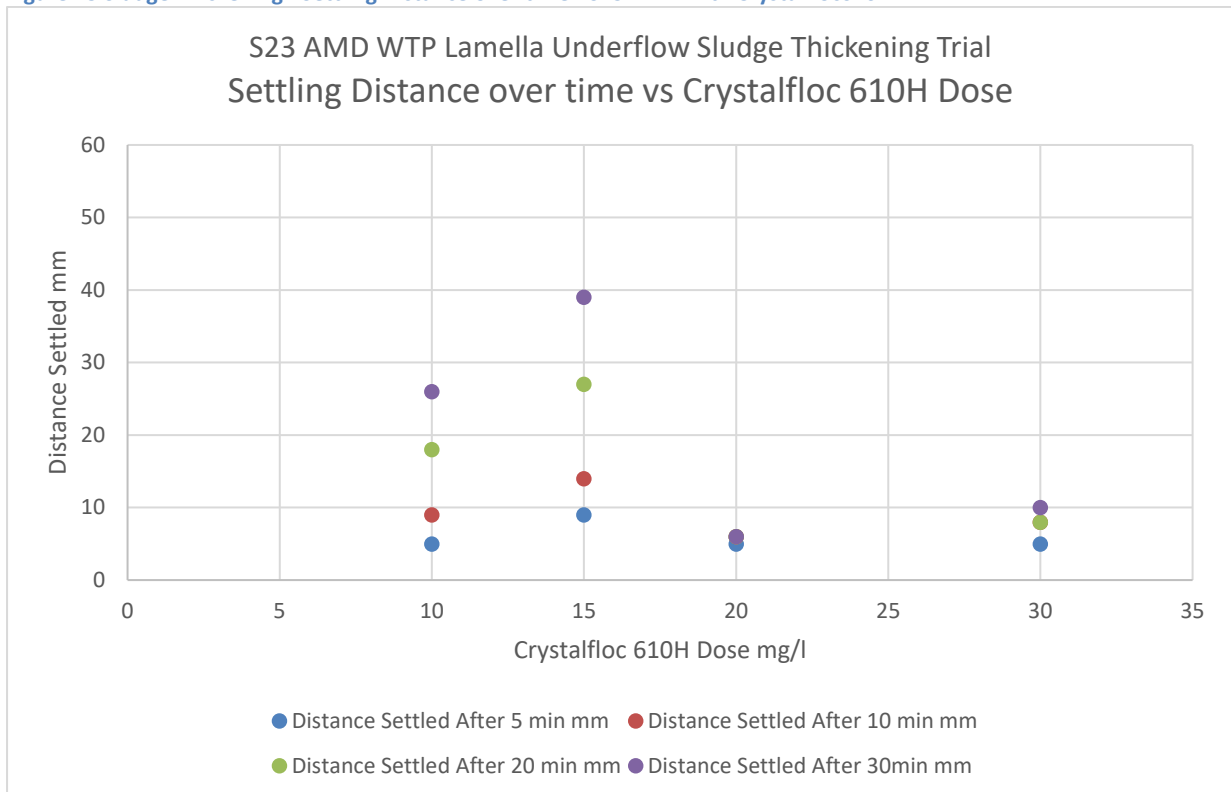
X

Figure 14 Sludge Thickening - Settling Distance over time - S23 AMD with Rheomax 1030



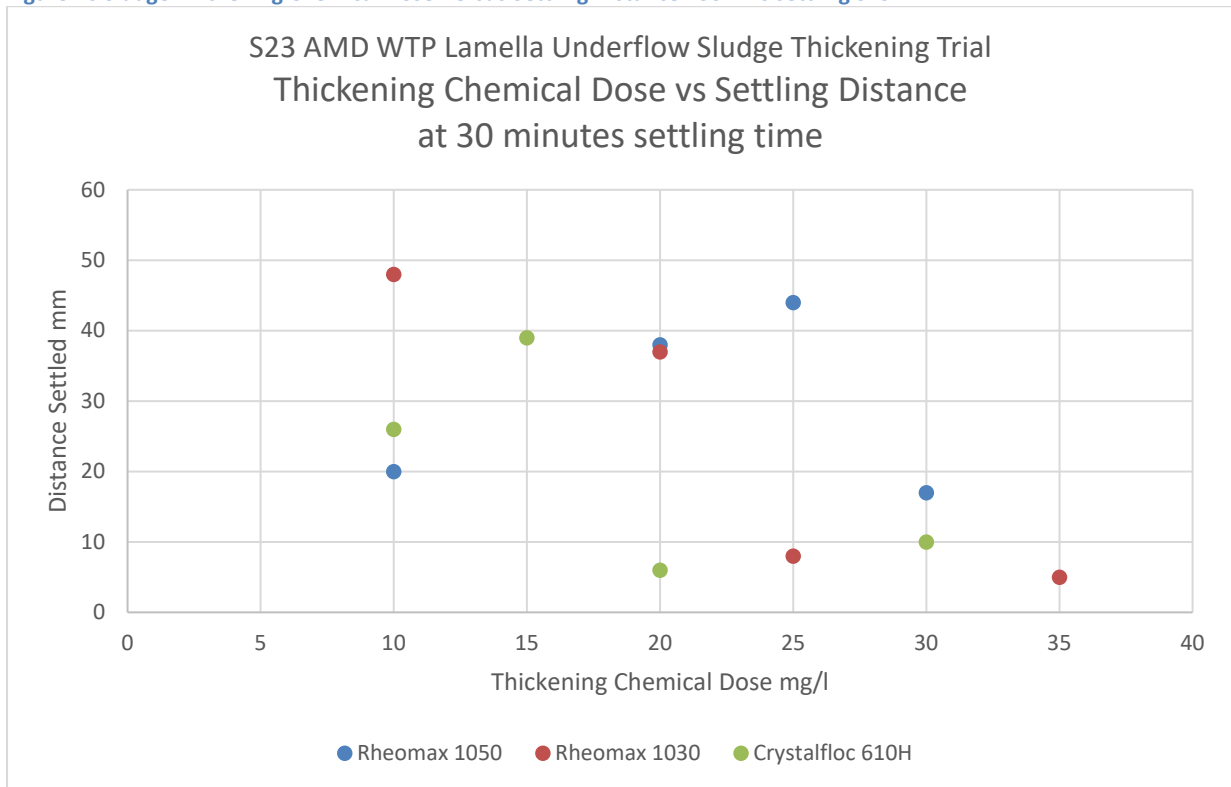
For S23 dosed with Rheomax1030, doses of 15mg/L and above did produce thickened sludge which was bulky and which did not settle.

Figure 15 Sludge Thickening - Settling Distance over time - S23 AMD with Crystalfloc610H



X

Figure 16 Sludge Thickening Chemical Dose Versus Settling Distance - 30mins settling S23 AMD



1.5.7 Thickening Settling Rates Comparison

There was more settling evident with the Manchester St samples, and higher settling rates with Rheomax1050 and Crystalfloc 610H producing the better settling rates of 0.36 m/hr. Figure 17 presents a comparison of xxxxxxx and Figure 18 presents a comparison of xxxxx.

Figure 17 Best Settling Rates for Thickened and Unthickened Sludge – Manchester AMD

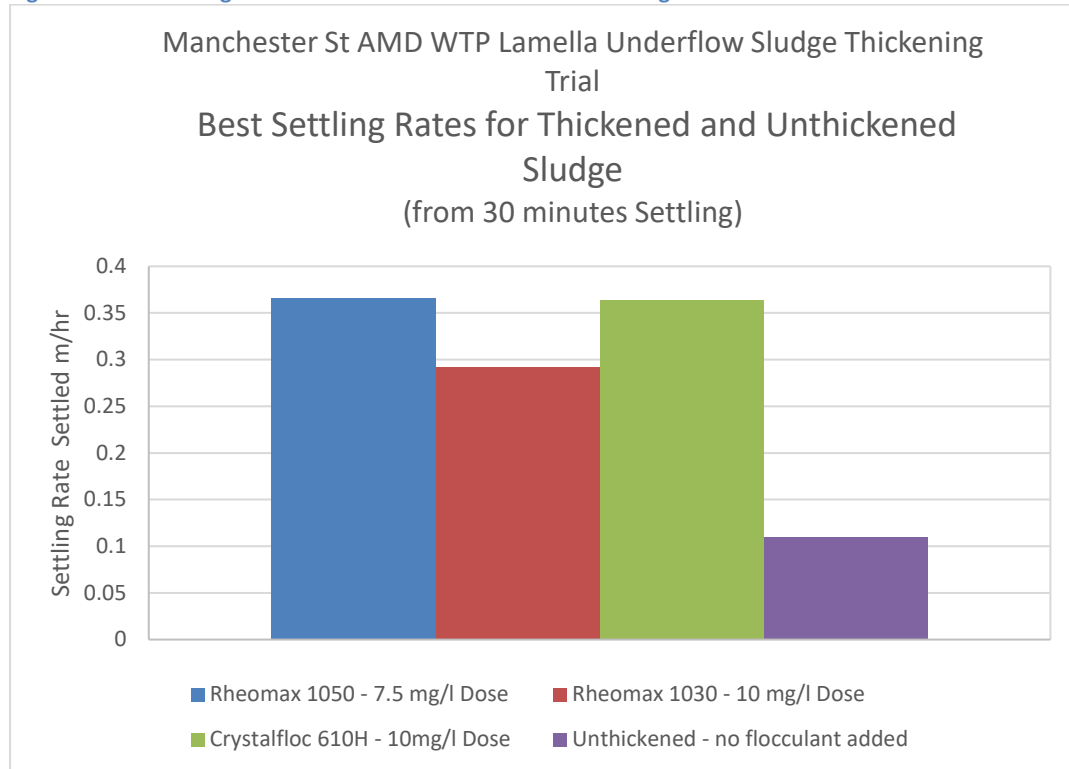
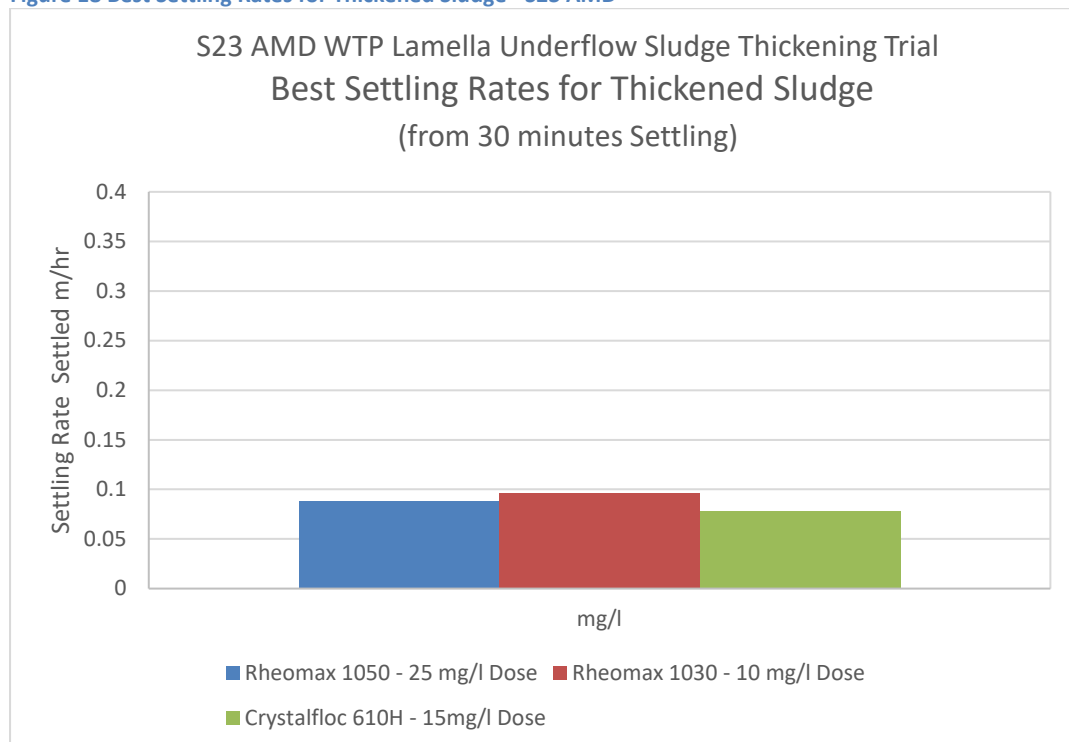


Figure 18 Best Settling Rates for Thickened Sludge - S23 AMD



1.6 Dewatering testing

After settled sludge has been retained for testing, dewatering techniques were trialled to investigate the sludge characteristics for dewatering of both thickened and unthickened sludge.

Generally, the Gravity Dewatered thickened sludge produced a sludge with spadable but gelatinous consistency. The pressure dewatered thickened sludge produced a soft but drier spadable sludge cake. The following section describes the methods and results of these trials.

1.6.1 Methodology

The methods used for Gravity and Pressure Dewatering is described below. This follows the Laboratory Testing for Sludge Press Dewatering method described by the reference video from University of Texas El Paso College of Engineering/El Paso Water Utilities Public Service Board. A dewatering assembly was built by PFL and used to measure the gravity and pressure dewatering properties of the different sludge mixes.

Gravity dewatering trials were carried out as follows:

- Take 250mL of sludge sample and pour through belt press filter fabric
- Allow to drain for 2 mins (or longer if still dripping)
- Measure volume of filtrate and visually observe extent of floc carry through
- Remove sludge caught on filter fabric and determine moisture content by oven drying

Pressure dewatering trials were carried out as follows:

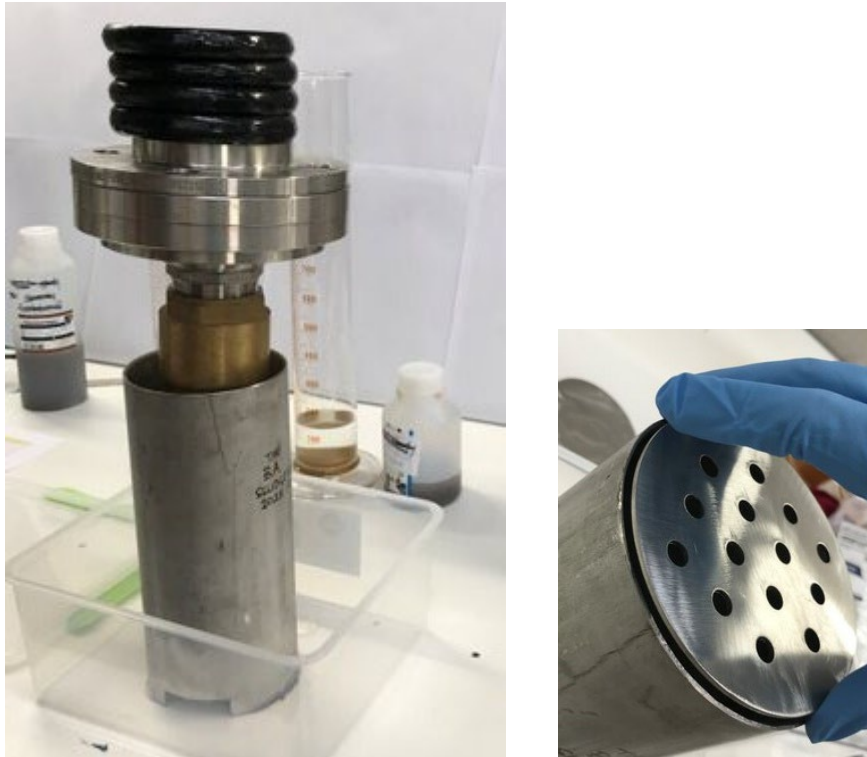
- Take 250mL of sludge sample and pour through belt press filter fabric
- Add top pressure filter fabric and absorbent material (15 paper towels)
- Add top filter press plates and 15.045kg weight (every 1kg = 1.08139kPa for this diameter press so 15.045kg = 16.27kPa)
- Allow to drain for 5 mins (or record time until dripping stops)
- Measure volume of filtrate and visually observe extent of floc carry through
- Remove sludge cake from filter fabric and determine moisture/solids content by oven drying

Pressure Dewatering Equipment (see Figure 19):

The Sludge Press Pressure Dewatering Assembly consisted of the following:

- Plastic Filtrate Catch Tray
- 107.5mm diameter stainless steel housing
- PVC filter support
- Perforated stainless steel lower disc plate
- Belt Press Filter Fabric disc
- (Sludge Sample)
- Upper Pressure Filter fabric
- Perforated stainless steel upper disc plate
- Paper towels discs (15)
- Upper Stainless Steel Pressure Disc (flat plate)
- Pressure Plunger
- Pressure Weights

Figure 19 Pressure Dewatering Assembly (Left) and Perforated Disc (Right)



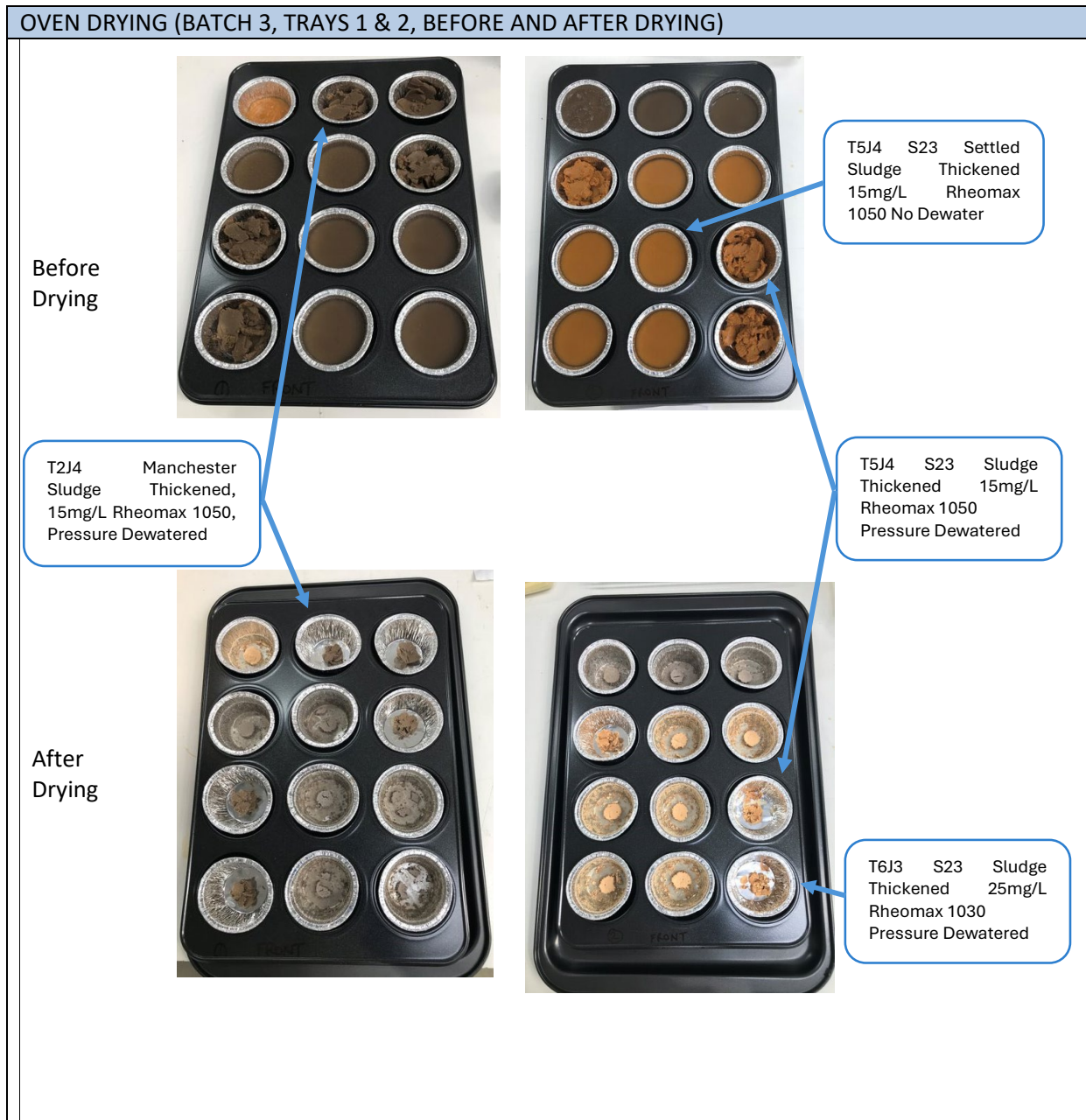
Method for determining Solids Content (% Dry Matter)

- Take 100mL of sample and place in aluminium pan.
- Record wet weight
- Oven Dry at 105°C for 10-12 hrs
- Record dry weight
- Loss in weight due to moisture driven off is used to calculate the Dry Matter content for the sample
- Return samples to oven for further 1 hour and re-weigh. Repeat until weight change is less than 4%
- Dry Matter (DM%) is then calculated as (weight of dry sample/weight of wet sample) x 100.
- Figure 20 shows samples prior to and after drying using this method.

This method is based on the following methods for determining dry matter or total solids content:

- Development of a laboratory procedure to determine dry matter in maize forage R.J. Hill and S. Ballinger, Agronomy N.Z 34 2004 pp109-115).
- <https://www.landcareresearch.co.nz/partner-with-us/laboratories-and-diagnostics/environmental-chemistry-laboratory/soil-testing/#s105>
Test Method no. 104(ii) Water Content
Rayment, G.E. and Lyons, D.J. 2011. Soil Chemical Methods – Australasia.
- Standard Methods for the Examination of Water and Wastewater 24th Edition, American Public Health Association, Lipps, W. C., Braun-Howland, E. B., and Baxter, T.E., Method 2540 Total Solids Dried from 103 to 105°C.

Figure 20 Oven Drying of thickened and dewatered sludge samples

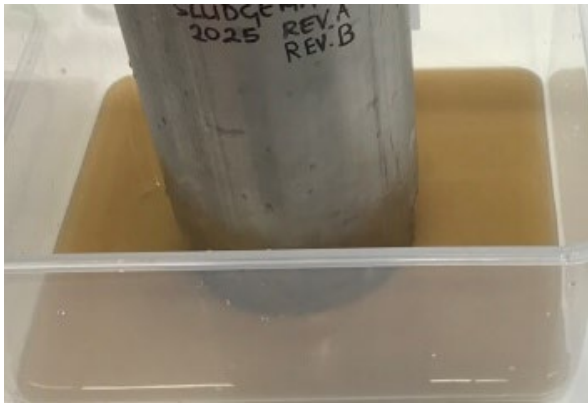
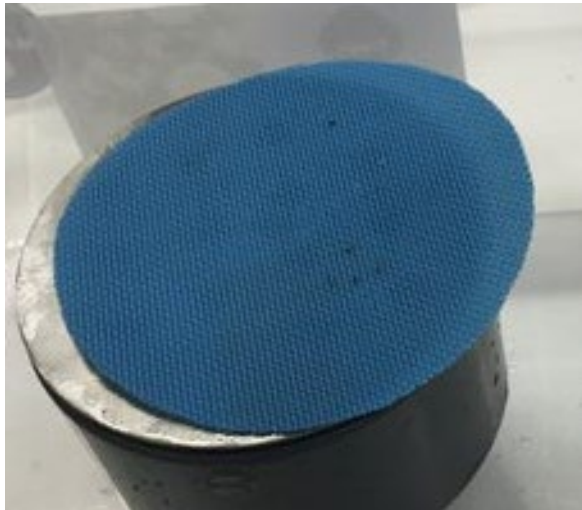


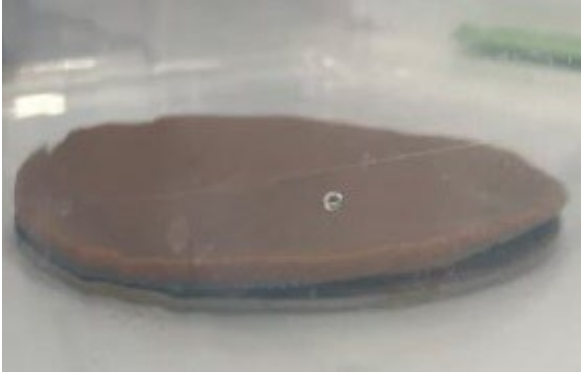
1.6.2 Dewatering Testing Visual Record

The following section contains photos of the dewatering tests on both Manchester St and S23 Thickened and unthickened sludge. There was variability in the floc carry through.

Unthickened Manchester sludge had complete floc carry through into the filtrate, with minimal floc capture on the belt press fabric (see photos below). S23 Unthickened sludge had high floc carry through but still had moderate capture on the belt fabric.

Figure 21 Dewatering of Unthickened Sludge

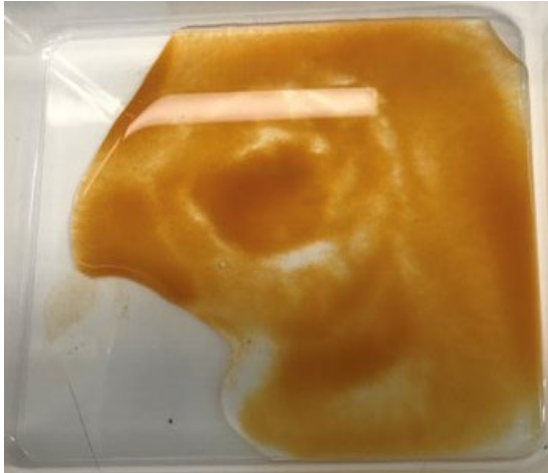
UNTHICKENED SLUDGE	
	• Unthickened sludge • Manchester Barrel T2T6 Mix • Complete Floc carry through into filtrate
	• Unthickened sludge • Manchester Barrel T2T6 Mix • Minimal Floc Capture on Belt

UNTHICKENED SLUDGE	
	• Unthickened Sludge • S23 Barrel T10 Sludge • Lots of Floc carry through to Filtrate
	• Unthickened Sludge • S23 Barrel T10 Sludge • Moderate floc capture on Belt
	• Unthickened Sludge • S23 Barrel T10 Sludge • Moderate floc capture on Belt

For the lower doses of thickening chemical, the Manchester sludge had high floc carry through on the gravity dewater and corresponding minimal floc capture on the belt fabric. Similarly for the S23 with lower chemical doses, there was moderate to high floc carry trough, with a lesser volume retained on the belt fabric.

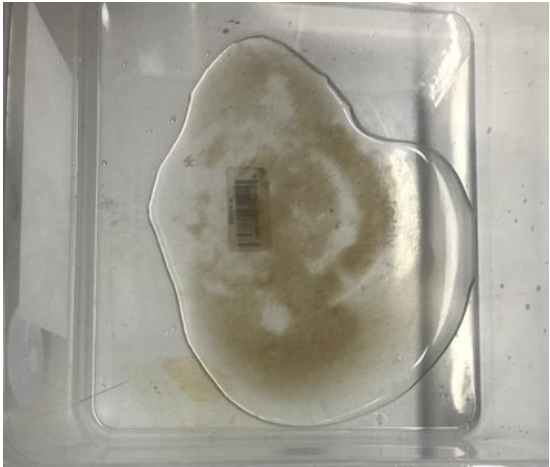
Figure 22 Gravity Dewatering Photos - Tests that worked poorly

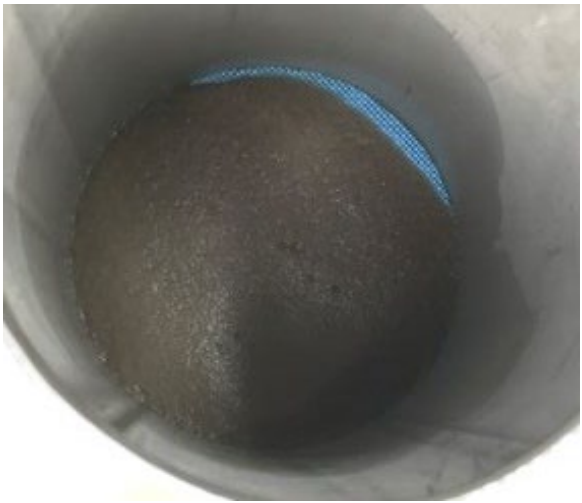
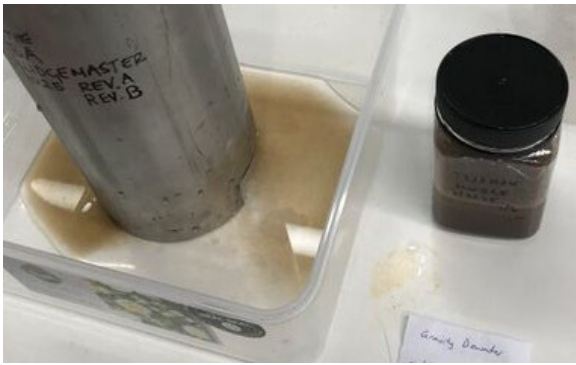
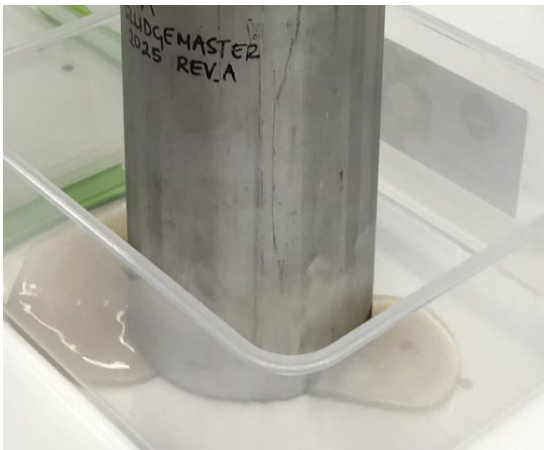
GRAVITY DEWATER TESTS WORKED POORLY	DETAILS
	• T2J1 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1050 • 4mg/L • Minimal floc capture on Belt
	• T4J2 • Manchester Barrel Sludge T2T6 Mix • Crystalfloc610H • 5 mg/L • Gravity Dewater – Minimal Floc Capture
	• T4J2 • Manchester Barrel Sludge T2T6 Mix • Crystalfloc610H • 5 mg/L • Gravity Dewater - High Floc Carry Through

GRAVITY DEWATER TESTS WORKED POORLY	DETAILS
	• T6J2 • S23 Barrel T10 Sludge • Rheomax 1030 • 20mg/L • Gravity Dewater – Moderate Floc Carry Through
	• T5J2 • S23 Barrel T10 Sludge • Rheomax 1050 • 20 mg/L • High floc carry through
	• T5J1 • S23 Barrel T10 Sludge • Rheomax 1050 • 30 mg/L • Moderate floc carry through

For the Manchester St thickened sludge with higher dose (below), there was a high solids capture on the belt fabric with gravity dewatering and minimal floc carry though and the same was evident with the S23.

Figure 23 Gravity Dewatering Photos - Tests that worked well

GRAVITY DEWATER WORKED WELL	DETAILS
	• T2J4 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1050 • 15mg/L • High Solids Capture on Filter
	• T2J4 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1050 • 15mg/L • Minimal Floc Carry Through

GRAVITY DEWATER WORKED WELL	DETAILS
	• T3J3 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1030 • 10mg/L • Gravity Dewater high solids capture on filter
	• T3J3 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1030 • 10mg/L • Gravity Dewater – Minimal Floc Carry through
	• T2J2 • Manchester Barrel Sludge T2T6 Mix • Rheomax1050 • 7.5mg/L • Moderate Floc Carry Through

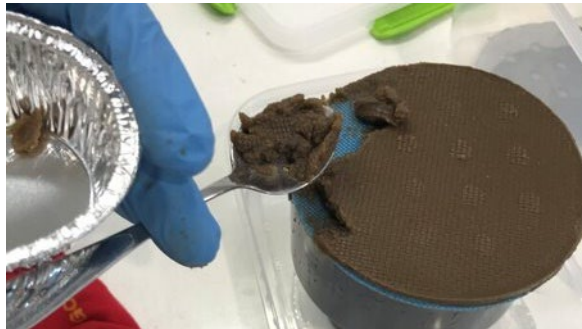
GRAVITY DEWATER WORKED WELL	DETAILS
	• T3J4 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1030 • 15mg/L • Gravity Dewater – minimal floc carry through
	• T5J3 • S23 Barrel T10 Sludge • Rheomax 1050 • 10 mg/L • Gravity Dewater - Showing Sludge Consistency • Final Dry Matter 3.96 %
	• T6J4 • S23 Barrel T10 Sludge • Rheomax 1030 • 35 mg/L • Moderate – low floc carry through

GRAVITY DEWATER WORKED WELL	DETAILS
	• T6J4 • S23 Barrel T10 Sludge • Rheomax 1030 • 35 mg/L • Gravity Dewater – Showing Sludge Consistency • Final Dry Matter 4.139 %
	• T7J2 • S23 Barrel T10 Sludge • Crystalfloc610H • 15mg/L • Gravity Dewater - Showing Sludge Consistency • Final Dry Matter 4.176 %

With Manchester St Thickened sludges that were pressure dewatered, Rheomax1050 produced a relatively strong cake at several thickening doses. Crystalfloc610H on a higher dose had very clear filtrate and produced a strong cake. This sludge (T4J4) was very bulky, noticeably thicker and did not flow well, so this needs consideration in pumping and handling at the plant depending on the technology used. S23 with Rheomax1050 gave a moderately strong cake which came off the filter fabric cleanly. Rheomax1030 with S23 gave a weaker cake which didn't come off the belt fabric clean.

Note T6J3 (photos below) with 25 mg/L Rheomax 1030 gave a slightly higher solids capture on belt 25g vs 19g, but T6J3 had the lower solids % dry matter after Pressure Dewater and Drying.

Figure 24 Pressure Dewatering Photos - Tests that worked well

PRESSURE DEWATER WORKED WELL	RELATIVELY STRONG CAKE
	• T2J2 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1050 • 7.5 mg/L • Pressure Dewater showing Relatively Strong Cake • Final Dry Matter 6.339%
	• T2J4 • Manchester Barrel Sludge T2T6 Mix • Rheomax1050 • 15mg/L • Pressure Dewatered Cake Consistency • Final Dry Matter 7.456%
	• T2J4 • Manchester Barrel Sludge T2T6 Mix • Rheomax1050 • 15mg/L • Pressure Dewatered Cake Consistency • Final Dry Matter 7.456%

PRESSURE DEWATER WORKED WELL	RELATIVELY STRONG CAKE
	• T4J4 • Manchester Barrel Sludge T2T6 Mix • Crystalfloc610H • 15mg/L • Thickened Sludge Consistency – Very thick
	• T4J4 • Manchester Barrel Sludge T2T6 Mix • Crystalfloc610H • 15mg/L • Filtrate Quality – Very Clear
	• T4J4 • Manchester Barrel Sludge T2T6 Mix • Crystalfloc610H • 15mg/L • Cake Consistency – Strong • (Final Dry Matter 7.995%)

PRESSURE DEWATER WORKED WELL	RELATIVELY STRONG CAKE
	• T3J3 • Manchester Barrel Sludge T2T6 Mix • Rheomax 1030 • 10mg/L • Pressure Dewatered Cake Consistency – spade-able but cake does not come away in large sections • Final Dry Matter 7.64%
	• T5J2 • S23 Barrel T10 Sludge • Rheomax 1050 • 20 mg/L • Pressure Dewater • Moderately Strong Cake – comes off filter cleanly and holds together in portions • Final Dry Matter 8.065%

PRESSURE DEWATER WORKED WELL	RELATIVELY STRONG CAKE
	• T6J4 • S23 Barrel T10 Sludge • Rheomax 1030 • 35 mg/L • Dewater Filtrate - Moderate Floc Carry Through
	• T6J4 • S23 Barrel T10 Sludge • Rheomax 1030 • 35 mg/L • Pressure Dewater Cake • Final Dry Matter 8.395%
	• T6J4 • S23 Barrel T10 Sludge • Rheomax 1030 • 35 mg/L • Pressure Dewater Cake consistency – Spadeable but does not come off belt cleanly • Final Dry Matter 8.395%

S23 with Rheomax10505 25mg/l had a high floc carry through with a lesser capture on the belt. The cake was spadable.

Figure 25 Pressure Dewatering Photos showing tests that worked poorly

PRESSURE DEWATER WORKED POORLY	
	• T5J4 • S23 Barrel T10 Sludge • Rheomax 1050 • 25 mg/L • Dewater Filtrate - High Floc Carry Through
	• T5J4 • S23 Barrel T10 Sludge • Rheomax 1050 • 25 mg/L • Final Dry Matter 7.744 % • Despite high floc carry through, final cake still has reasonably high solids content

S23 Thickened sludge (with CrystalFloc610H) with no settling was tested via gravity dewatering. It provided moderate to good belt capture but the final dry matter was slightly lower than the dry matter for settled thickened S23 sludge indicating more floc carry through.

S23 Thickened sludge with no settling and subject to pressure dewatering showed filter cake holding together well and coming away cleanly from the belt. This did have a moderately high floc carry through.

Figure 26 Dewatering Photos showing Thickened Sludge (no settling)

THICKENED SLUDGE NO SETTLE	
	• T7J3 • S23 Barrel T10 Sludge • CrystalFloc610H • 20mg/L • No Settle Gravity Dewater • Final Dry Matter 3.952%
	• T7J4 • S23 Barrel T10 Sludge • CrystalFloc610H • 30mg/L • No Settle Pressure Dewater – Filter Cake holds together well and comes away from belt filter cleanly • Final Dry Matter 8.206 %

THICKENED SLUDGE NO SETTLE	
	• T7J4 • S23 Barrel T10 Sludge • CrystalFloc610H • 30mg/L • Dewater Filtrate - High Floc Carry Through

1.6.3 Dewatering Results

1.6.3.1 Thickening, Settling and Dewatering Observations

- Manchester St New with Rheomax 1050
 - Best Pressure Dewater for this chemical was at 15mg/L but the best settling was at dose of 7.5mg/L
- Manchester St New with Rheomax 1030
 - Best Gravity dewater was at dose of 15mg/L but pressure dewater at dose of 10mg/L gave equivalent result to Rheo1050 at the dose of 15mg/L.
- Manchester St New with Crystalfloc610H
 - Best settling for this chemical at 10 mg/l but best Pressure dewater at 15mg/l (settled less well due to bulk)
- S23 with Rheomax 1050
 - Gravity dewaterers were similar for doses of 10 and 30mg/L. Dose of 20mg/L gave best pressure dewater
- S23 with Rheomax 1030
 - Dose of 35mg/L gave best pressure dewater with dose of 20mg/L giving best gravity dewater
- S23 with Crystalfloc 610H
 - Dose of 30mg/L gave a better result than Rheo1050 at 20mg/L for the Pressure dewater.
 - Dose of 10mg/L gave best settling but settling rates were low for S23 due to the bulk. Dose of 20mg/L gave better gravity dewater.

1.6.4 Dry matter % results

The following are results of dry matter percentage testing on the following:

- Thickened and settled sludge
- Gravity dewatered sludge after thickening and settling
- Gravity dewatered sludge unthickened with settling
- Pressure dewatered sludge after thickening and settling
- Pressure dewatered sludge unthickened with settling

In summary the ranges for dry matter percentages were:

Manchester Thickened Sludge range 0.6 – 1.34% (0.57% unthickened)

S23 Thickened Sludge range 1.81-2.60% (1.87% unthickened)

Manchester Gravity dewater range 2.88-3.33%

S23 Gravity dewater range 3.93-4.18%

Manchester Pressure dewater range 6.34-7.99%

S23 Pressure dewater range 7.74-8.21%

The following tables and graphs show the tested gravity and pressure dewatering results. Not all thickening doses were tested for all dewatering types, but a selection of each chemical and dose was chosen, with better thickening results tested on both gravity and pressure dewatering.

Figure 27 Sludge Thickening - Chemical Dose versus Dry Matter - Manchester

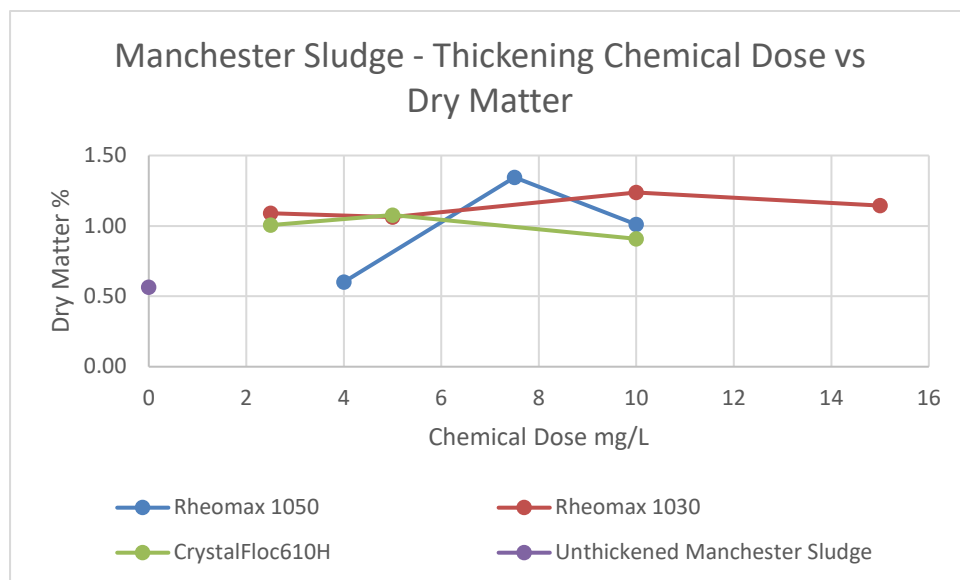


Table 11 Manchester Sludge - Thickening and Settling - Chemical Dose versus Dry Matter

MANCHESTER SLUDGE – THICKENING & SETTLING - CHEMICAL DOSE VS DRY MATTER					
Rheomax 1050	mg/L	4	7.5	10	15
Dry Matter	%	0.60	1.34	1.01	
Rheomax 1030	mg/L	2.5	5	10	15
Dry Matter	%	1.09	1.06	1.24	1.14
CrystalFloc610H	mg/L	2.5	5	10	15
Dry Matter	%	1.01	1.08	0.91	
Unthickened Manchester Sludge	mg/L	0			
Dry Matter	%	0.57			

Figure 28 Sludge Thickening - Chemical Dose versus Dry Matter - S23

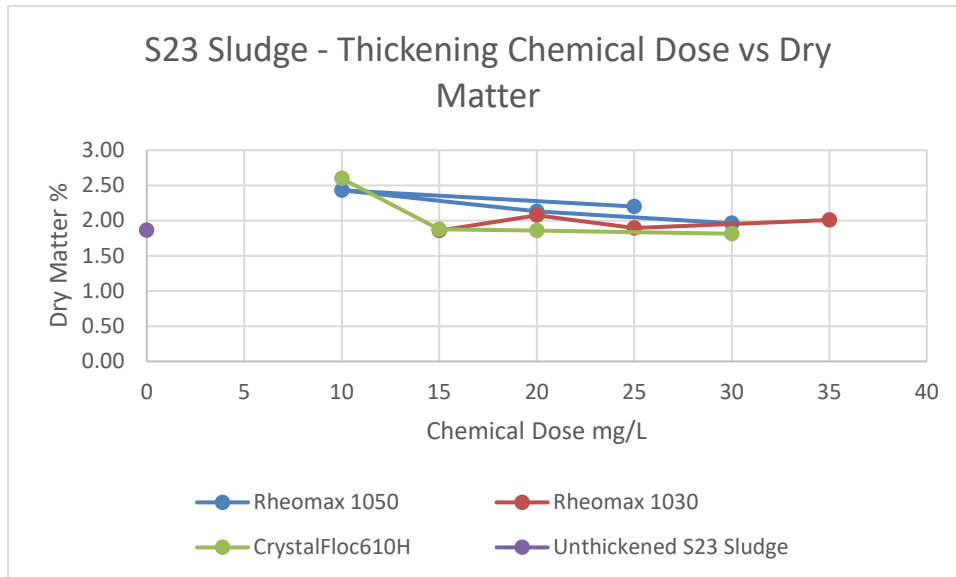


Table 12 S23 Sludge - Thickening and Settling - Chemical Dose versus Dry Matter

S23 SLUDGE – THICKENING & SETTLING - CHEMICAL DOSE VS DRY MATTER					
Rheomax 1050	mg/L	30	20	10	25
Dry Matter	%	1.96	2.13	2.43	2.20
Rheomax 1030	mg/L	15	20	25	35
Dry Matter	%	1.86	2.08	1.90	2.01
CrystalFloc610H	mg/L	10	15	20	30
Dry Matter	%	2.60	1.88	1.86	1.81
Unthickened S23 Sludge	mg/L	0			
Dry Matter	%	1.87			

1.6.5 Gravity Dewatering Results

Gravity dewatering trials were carried out as follows:

- Take 250mL of sludge sample and pour through belt press filter fabric
- Allow to drain for 2 mins (or longer if still dripping)
- Measure volume of filtrate and visually observe extent of floc carry through
- Remove sludge caught on filter fabric and determine moisture content by oven drying

X

Figure 29 Gravity Dewatered Thickened Manchester Sludge - Thickening Chemical Dose versus Dry Matter

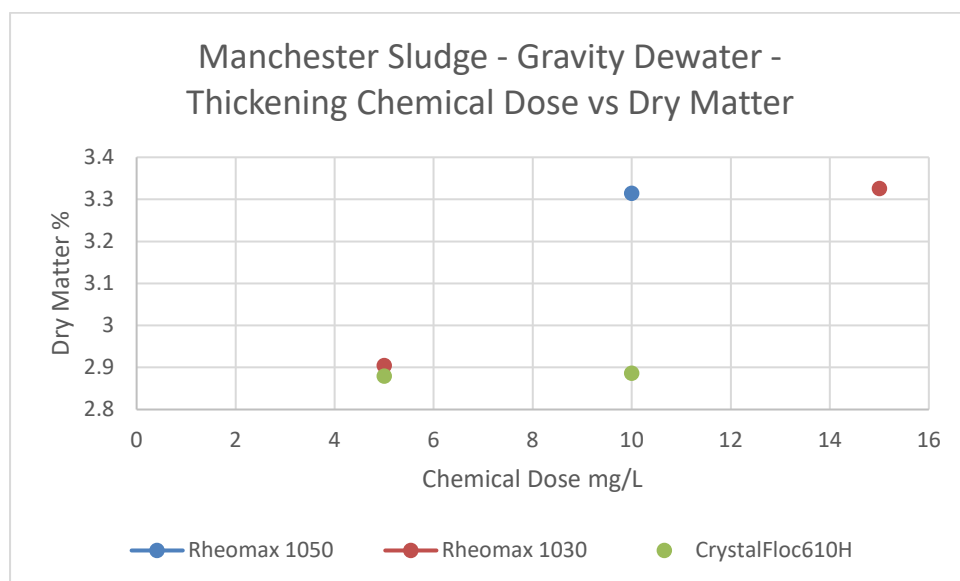


Table 13 Manchester Sludge - Gravity Dewater - Chemical Dose versus Dry Matter

MANCHESTER SLUDGE - GRAVITY DEWATER - CHEMICAL DOSE VS DRY MATTER					
Rheomax 1050	mg/L	4	7.5	10	15
Dry Matter	%			3.31	
Rheomax 1030	mg/L	2.5	5	10	15
Dry Matter	%		2.90		3.33
CrystalFloc610H	mg/L	2.5	5	10	15
Dry Matter	%		2.88	2.89	

Figure 30 Gravity Dewatered Thickened S23 Sludge - Thickening Chemical Dose versus Dry Matter

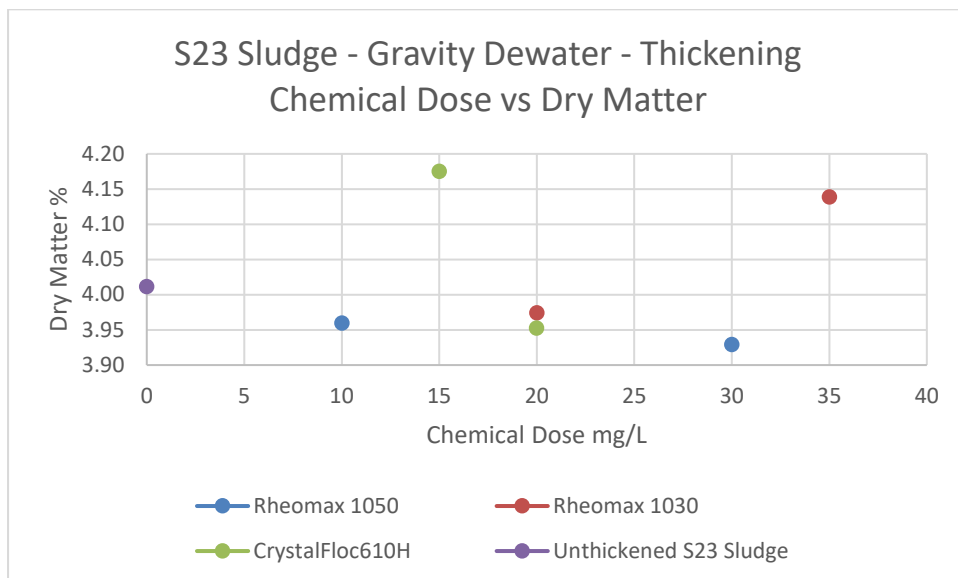


Table 14 S23 Sludge - Gravity Dewater - Chemical Dose versus Dry Matter

S23 SLUDGE - GRAVITY DEWATER - CHEMICAL DOSE VS DRY MATTER					
Rheomax 1050	mg/L	30	20	10	25
Dry Matter	%	3.93		3.96	
Rheomax 1030	mg/L	15	20	25	35
Dry Matter	%		3.97		4.14
CrystalFloc610H	mg/L	10	15	20	30
Dry Matter	%		4.18	3.95	
Unthickened S23 Sludge	mg/L	0			
Dry Matter	%	4.01			

1.6.6 Pressure Dewatering Results Graphs

The pressure dewatering graphs and tables shown in figures 31 and 32, and Tables 15 and 16 compare thickening chemicals with resulting dry matter for each water type the outcomes of these tests are discussed in section 1.6.8.

x

Figure 31 Pressure Dewatered Thickened Manchester Sludge - Thickening Chemical versus Dry Matter

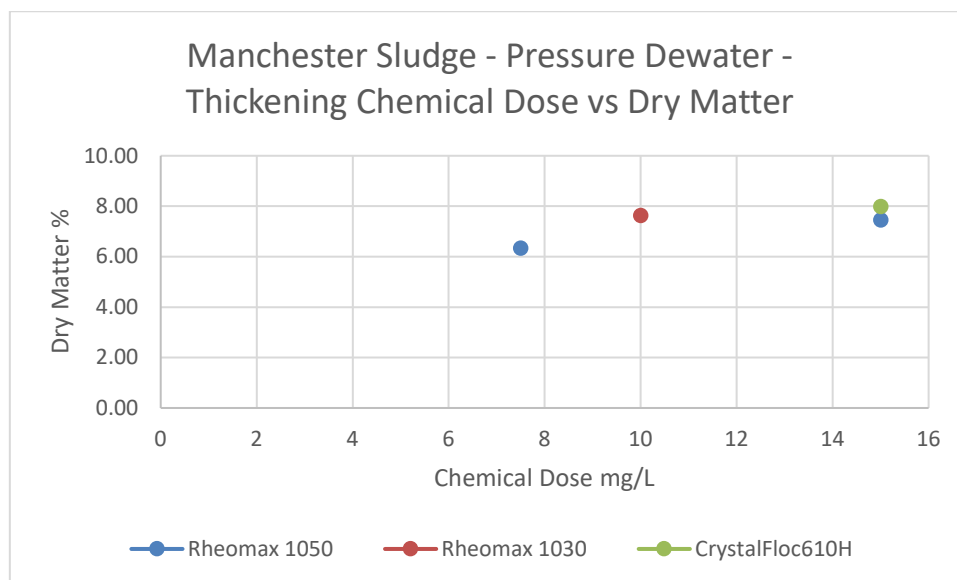


Table 15 Manchester Sludge - Pressure Dewater - Chemical Dose Versus Dry Matter

MANCHESTER SLUDGE - PRESSURE DEWATER - CHEMICAL DOSE VS DRY MATTER					
Rheomax 1050	mg/L	4	7.5	10	15
Dry Matter	%		6.34		7.46
Rheomax 1030	mg/L	2.5	5	10	15
Dry Matter	%			7.64	
CrystalFloc610H	mg/L	2.5	5	10	15
Dry Matter	%				7.99

Figure 32 Pressure Dewatered Thickened S23 Sludge - Thickening Chemical versus Dry Matter

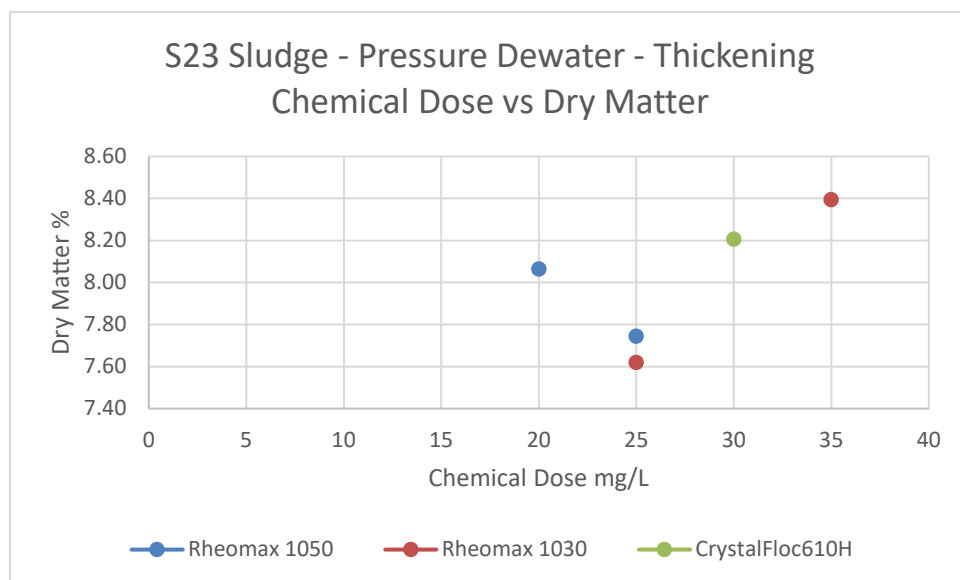


Table 16 S23 Sludge - Pressure Dewater - Chemical Dose Versus Dry Matter

S23 SLUDGE - PRESSURE DEWATER - CHEMICAL DOSE VS DRY MATTER					
Rheomax 1050	mg/L	30	20	10	25
Dry Matter	%		8.06		7.74
Rheomax 1030	mg/L	15	20	25	35
Dry Matter	%			7.62	8.39
CrystalFloc610H	mg/L	10	15	20	30
Dry Matter	%				8.21

1.6.7 Sludge Quality Test Results

Sludge quality was tested to determine metal content and dry matter (S23 results are depicted as mg/kg and converted to mg/l on the following page).

Figure 33 Sludge Results for S23 Barrel Test 10 Sludge - Raw Laboratory Results mg/kg dry wt

SAMPLE TYPE: SLUDGE T10 S23 – PRE THICKENING/DEWATERING – RESULTS IN MG/KG		
	Sample Name:	S23 (New) Test ID Sludge 31-Mar-2025
	Lab Number:	3842877.1
Dry Matter	g/100g as rcvd	2.9
Total Recoverable Aluminium	mg/kg dry wt	110,000
Total Recoverable Arsenic	mg/kg dry wt	40
Total Recoverable Cadmium	mg/kg dry wt	2.3
Total Recoverable Chromium	mg/kg dry wt	57
Total Recoverable Cobalt	mg/kg dry wt	192
Total Recoverable Iron	mg/kg dry wt	91,000
Total Recoverable Lead	mg/kg dry wt	0.5
Total Recoverable Magnesium	mg/kg dry wt	23,000
Total Recoverable Manganese	mg/kg dry wt	5,400
Total Recoverable Nickel	mg/kg dry wt	530
Total Recoverable Sodium	mg/kg dry wt	148
Total Recoverable Zinc	mg/kg dry wt	3,000
Chloride	mg/kg dry wt	340
pH	pH Units	8.44
Nitrite-N	mg/kg dry wt	< 17
Nitrate-N	mg/kg dry wt	28
Nitrate-N + Nitrite-N	mg/kg dry wt	28
Sulphate	mg/kg dry wt	17,700

Figure 34 Sludge Results for S23 Barrel Test 10 Sludge - converted to g/m3

SAMPLE TYPE: SLUDGE T10 S23 – PRE THICKENING/DEWATERING – RESULTS IN G/M3		
	Sample Name:	S23 (New) Test ID Sludge 31-Mar-2025
	Lab Number:	3842877.1
Dry Matter	g/100g as rcvd	2.9
Total Recoverable Aluminium	g/m3	3190
Total Recoverable Arsenic	g/m3	1.16
Total Recoverable Cadmium	g/m3	0.0667
Total Recoverable Chromium	g/m3	1.653
Total Recoverable Cobalt	g/m3	5.568
Total Recoverable Iron	g/m3	2639
Total Recoverable Lead	g/m3	0.0145
Total Recoverable Magnesium	g/m3	667
Total Recoverable Manganese	g/m3	156.6
Total Recoverable Nickel	g/m3	15.37
Total Recoverable Sodium	g/m3	4.292
Total Recoverable Zinc	g/m3	87
Chloride	g/m3	9.86
pH	pH Units	8.44
Nitrite-N	g/m3	0.493
Nitrate-N	g/m3	0.812
Nitrate-N + Nitrite-N	g/m3	0.812
Sulphate	g/m3	513.3

Note: The S23 Sludge sample was analysed at the Laboratory as a solid, due to the higher solids content. In order to allow comparison with the other sludge results, the Lab results have been converted from mg/kg dry wt basis to g/m3 using the assumption that the density of the sludge is 1g/mL and the dry matter was 2.9%. Therefore $\text{g/m}^3 = \text{mg/L} = \text{mg/kg dry wt} \times 0.029$.

Figure 35 Sludge Results for Manchester Barrel Test 2/Test 6 Mix Sludge (g/m3)

SAMPLE TYPE: SLUDGE MANCHESTER T2/T6MIX – PRE THICKENING/DEWATERING		
	Sample Name:	Barrel T2/T6 Sludge Jan 25 Mix 31-Jan-2025
	Lab Number:	3839043.1
Dry Matter	g/100g as rcvd	0.28
Total Recoverable Aluminium	g/m3	750
Total Recoverable Arsenic	g/m3	< 0.021
Total Recoverable Cadmium	g/m3	0.0173
Total Recoverable Chromium	g/m3	0.089
Total Recoverable Cobalt	g/m3	1.49
Total Recoverable Iron	g/m3	173
Total Recoverable Lead	g/m3	Not Reported
Total Recoverable Magnesium	g/m3	67
Total Recoverable Manganese	g/m3	23
Total Recoverable Nickel	g/m3	3.4
Total Recoverable Sodium	g/m3	Not Reported
Total Recoverable Zinc	g/m3	16.5
Chloride	g/m3	3.5
pH	pH Units	8.9
Nitrite-N	g/m3	< 0.10
Nitrate-N	g/m3	< 0.10
Nitrate-N + Nitrite-N	g/m3	< 0.10
Sulphate	g/m3	550
Sulphate-S	g/m3	182

1.6.8 Dewatering Conclusions and Recommendations

Overall, Thickening and settling results were not necessarily representative of the best dewatering results. For example, Manchester St with Rheomax 1050 had the best pressure dewatering result with this chemical at 15mg/L but the best settling was at a dose of 7.5mg/l.

S23 did not settle well for most tests due to its bulk. The pressure dewater and gravity dose of chemical for all chemicals used for S23 gave a different dose for the best pressure dewater, but for gravity dewater the thickening chemical dose was different to that for the best pressure dewater.

From a treatment process perspective, the following decisions need to be made when selecting sludge thickening and dewatering equipment:

1. Will there be an allowance for removal of supernatant at the thickening settling stage and if so, this would work well with Manchester St type water but not so well for S23 type water.
2. Gravity and pressure dewatering equipment selection and process selection will need to take into account potentially variable bulk of the sludge depending on influent AMD water quality and have the flexibility to cope with bulkier sludges which may be best sent straight to dewatering immediately after thickening chemical dosing as well as best bulky sludges that have been settled at the thickening stage.

APPENDIX A – HILLS LABORATORY TEST RESULTS

3638113-SP-2

3668046-SP-2

3839043-SP-1

3839044-SP-1

3839045-SP-1

3841393-SP-2

3842877-SP-1

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

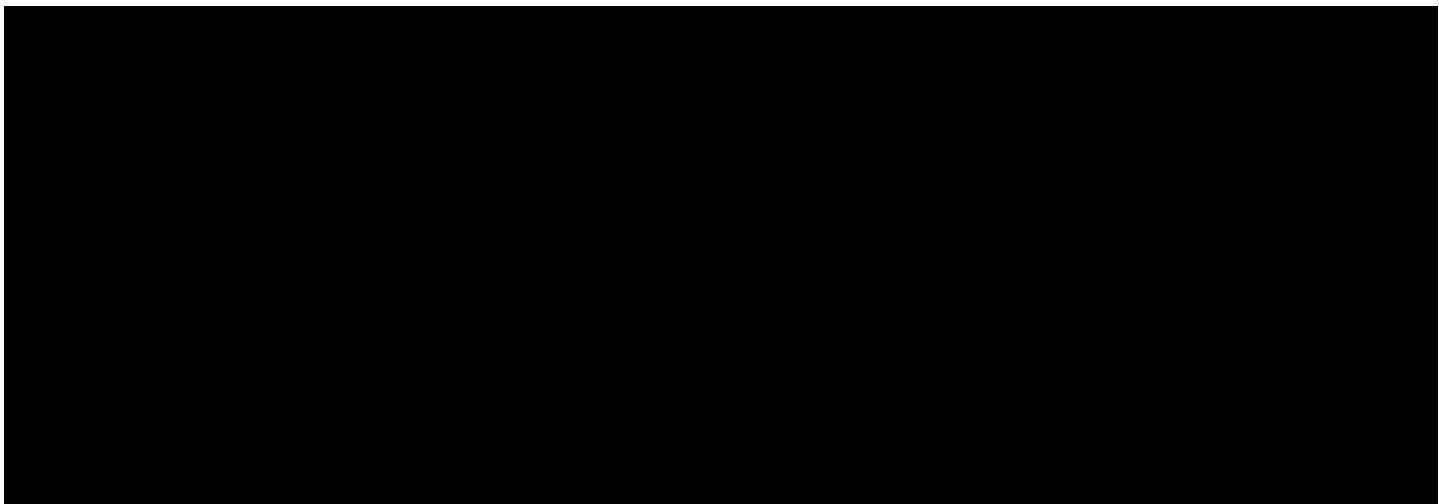
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.





Sample Type: Aqueous						
Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Hardness	g/m ³ as CaCO ₃	640	2,300	630	2,200	200
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Hardness	g/m ³ as CaCO ₃	650	650	640	630	640
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24



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Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Hardness	g/m ³ as CaCO ₃	2,200	2,200	196	197	620
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Hardness	g/m ³ as CaCO ₃	630	2,100	2,200	210	210
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments

Sample 20 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces report '3668046-SPv1' issued on 17-Sep-2024 at 2:08 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Jun-2025. 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.

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Sample Type: Aqueous

Sample Name:		Barrel T2/T6 Sludge Jan 25 Mix 31-Jan-2025	HDS Test 20 Sludge 21.03.25 21-Mar-2025
Lab Number:		3839043.1	3839043.2
Dry Matter	g/100g as rcvd	0.28	0.31
pH	pH Units	8.9	8.3
Total Aluminium	g/m ³	750	1,180
Total Arsenic	g/m ³	< 0.021	< 0.021
Total Cadmium	g/m ³	0.0173	0.021
Total Chromium	g/m ³	0.089	0.127
Total Cobalt	g/m ³	1.49	1.83
Total Iron	g/m ³	173	320
Total Magnesium	g/m ³	67	70
Total Manganese	g/m ³	23	26
Total Nickel	g/m ³	3.4	4.3
Total Zinc	g/m ³	16.5	25
Chloride	g/m ³	3.5	4.0
Nitrite-N	g/m ³	< 0.10	< 0.10
Nitrate-N	g/m ³	< 0.10	< 0.10
Nitrate-N + Nitrite-N	g/m ³	< 0.10	< 0.10
Sulphate	g/m ³	550	710
Sulphate-S*	g/m ³	182	240

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
pH	pH meter. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Aluminium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.063 g/m ³	1-2
Total Arsenic	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Cadmium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0011 g/m ³	1-2
Total Chromium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-2
Total Cobalt	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0042 g/m ³	1-2
Total Iron	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-2
Total Magnesium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-2
Total Manganese	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-2
Total Nickel	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-2
Total Zinc	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser, screen level. APHA 4500-NO ₂ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser, screen level. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Sulphate-S*	Calculation from SO ₄ .	0.2 g/m ³	1-2

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

Testing was completed between 02-Apr-2025 and 07-Apr-2025. 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.

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Sample Type: Aqueous			
Sample Name:		S23 New Jan 25 16-Jan-2025	Manchester St New Raw Jan 25 30-Jan-2025
Lab Number:		3839044.1	3839044.2
Individual Tests			
True Hazen Colour	Hazen units	< 10	< 10
Turbidity	NTU	1.08	16.8
pH	pH Units	2.6	3.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	1,970	350
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	1,110	197
Electrical Conductivity (EC)	mS/m	381	103.7
Total Suspended Solids	g/m ³	5	17
Total Solids (TS)	g/m ³	4,400	770
Dissolved Aluminium	g/m ³	220	46
Dissolved Calcium	g/m ³	199	53
Dissolved Cobalt	g/m ³	0.36	0.085
Dissolved Iron	g/m ³	170	3.5
Dissolved Magnesium	g/m ³	150	15.6
Dissolved Manganese	g/m ³	11.6	1.41
Dissolved Mercury	g/m ³	< 0.002	< 0.002
Total Sodium	g/m ³	3.8	3.6
Chloride	g/m ³	5.4	3.6
Sulphate	g/m ³	3,100	540
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.8
Total Organic Carbon (TOC)	g/m ³	1.8	2.0
Absorbance at 254 nm	AU cm ⁻¹	6.31	0.109
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn			
Dissolved Arsenic	g/m ³	0.066	< 0.0010
Dissolved Cadmium	g/m ³	0.0037	0.00082
Dissolved Chromium	g/m ³	0.107	0.0042
Dissolved Copper	g/m ³	0.084	0.0148
Dissolved Lead	g/m ³	< 0.0010	0.00159
Dissolved Nickel	g/m ³	1.02	0.20
Dissolved Zinc	g/m ³	5.8	0.99



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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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m ³	1-2
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-2
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-2
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-2
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-2
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-2
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-2
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-2
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-2
Dissolved Mercury	Filtered sample, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.002 g/m ³	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-2

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

Testing was completed between 01-Apr-2025 and 07-Apr-2025. 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.

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Sample Type: Aqueous						
Sample Name:		Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 523 New Supernatant 31-Jan-2025
Lab Number:		3839045.1	3839045.2	3839045.3	3839045.4	3839045.5
Turbidity	NTU	3.2	2.1	1.23	1.59	12.8
pH	pH Units	8.0	7.9	10.9	9.7	7.4
Total Alkalinity	g/m ³ as CaCO ₃	17.8	14.8	102	48	15.5
Total Hardness	g/m ³ as CaCO ₃	620	510	580	520	1,930
Total Suspended Solids	g/m ³	26	9	6	15	118
Dissolved Aluminium	g/m ³	1.50	1.67	14.9	7.7	0.096
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	183	230	210	600
Dissolved Chromium	g/m ³	0.0013	0.0009	0.0013	0.0012	0.0041
Dissolved Cobalt	g/m ³	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	12.8	13.4	0.08	0.56	107
Dissolved Manganese	g/m ³	0.0018	0.158	< 0.0005	< 0.0005	0.31
Dissolved Nickel	g/m ³	< 0.0005	0.0032	< 0.0005	< 0.0005	0.0009
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Organic Carbon (DOC)	g/m ³	0.6	< 0.5	0.6	< 0.5	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.013	0.004	0.015	0.014
Transmittance at 254 nm*	%T, 1 cm cell	98.5	97.1	99.1	96.6	96.8

Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Turbidity	NTU	2.1	0.56	3.3
pH	pH Units	8.7	8.0	7.7
Total Alkalinity	g/m ³ as CaCO ₃	23	15.0	13.4
Total Hardness	g/m ³ as CaCO ₃	640	660	630
Total Suspended Solids	g/m ³	14	4	7
Dissolved Aluminium	g/m ³	3.8	1.26	0.94
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	230	220
Dissolved Chromium	g/m ³	0.0012	0.0008	0.0008
Dissolved Cobalt	g/m ³	< 0.0002	0.0052	0.0044
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	17.1	22	21



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Sample Type: Aqueous				
Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Dissolved Manganese	g/m³	0.035	0.51	0.58
Dissolved Nickel	g/m³	< 0.0005	0.0149	0.0189
Dissolved Zinc	g/m³	< 0.0010	0.0011	< 0.0010
Dissolved Organic Carbon (DOC)	g/m³	< 0.5	0.7	0.5
Absorbance at 254 nm	AU cm ⁻¹	0.007	0.008	0.008
Transmittance at 254 nm*	%T, 1 cm cell	98.5	98.2	98.1

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-8
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-8
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-8
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-8
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-8
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-8
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-8
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-8
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-8
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-8
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-8
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-8
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-8
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-8

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

Testing was completed between 03-Apr-2025 and 11-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:		MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm	BVELF Bypass T1 J1J2 7.5 17-Mar-2025 3:00 pm
Lab Number:		3841393.1	3841393.2	3841393.3	3841393.4	3841393.5
Turbidity	NTU	33	38	6.6	12.3	3.6
pH	pH Units	8.9	9.4	8.4	8.8	7.4
Total Alkalinity	g/m ³ as CaCO ₃	24	24	13.0	16.0	14.6
Total Hardness	g/m ³ as CaCO ₃	650	660	650	650	200
Total Suspended Solids	g/m ³	-	-	-	-	33
Dissolved Aluminium	g/m ³	0.075	0.091	0.034	0.030	0.114
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00011
Dissolved Calcium	g/m ³	72	74	71	70	75
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0013	0.0009	0.0168	0.0075	0.024
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	115	115	114	115	3.5
Dissolved Manganese	g/m ³	0.090	0.036	1.13	0.65	0.37
Dissolved Nickel	g/m ³	0.0188	0.0152	0.100	0.066	0.048
Dissolved Zinc	g/m ³	< 0.0010	0.0012	0.0033	0.0023	0.033
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.9	0.7	1.0	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.008	0.007	0.005	0.008	0.036
Transmittance at 254 nm*	%T, 1 cm cell	98.1	98.4	98.8	98.3	92.1

Sample Name:		BVELF Bypass T1 J3J4 7.0 17-Mar-2025 3:00 pm	BVELF Bypass T3 J1J2 6.5 19-Mar-2025 12:00 pm	BVELF Bypass T3 J3J4 6.0 19-Mar-2025 12:00 pm	BVELF Bypass T2 J1J4 5.5 17-Mar-2025 4:00 pm	MAN Bypass T5 J1J2 7.5 19-Mar-2025 2:45 pm
Lab Number:		3841393.6	3841393.7	3841393.8	3841393.9	3841393.10
Turbidity	NTU	4.5	3.8	5.8	2.9	2.1
pH	pH Units	6.5	6.6	6.4	5.9	6.8
Total Alkalinity	g/m ³ as CaCO ₃	7.5	9.3	7.4	4.0	12.5
Total Hardness	g/m ³ as CaCO ₃	193	194	196	186	650
Total Suspended Solids	g/m ³	37	38	39	35	19
Dissolved Aluminium	g/m ³	0.025	0.023	0.018	0.097	0.062
Dissolved Cadmium	g/m ³	0.00029	0.00030	0.00032	0.00035	0.00017
Dissolved Calcium	g/m ³	71	72	72	69	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008
Dissolved Cobalt	g/m ³	0.044	0.044	0.046	0.047	0.024
Dissolved Copper	g/m ³	0.0009	0.0006	0.0008	0.0050	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	0.00014	< 0.00010	0.00019	0.00185	< 0.00010



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Sample Type: Aqueous						
Sample Name:		BVELF Bypass T1 J3J4 7.0 17-Mar-2025 3:00 pm	BVELF Bypass T3 J1J2 6.5 19-Mar-2025 12:00 pm	BVELF Bypass T3 J3J4 6.0 19-Mar-2025 12:00 pm	BVELF Bypass T2 J1J4 5.5 17-Mar-2025 4:00 pm	MAN Bypass T5 J1J2 7.5 19-Mar-2025 2:45 pm
Lab Number:		3841393.6	3841393.7	3841393.8	3841393.9	3841393.10
Dissolved Magnesium	g/m ³	3.6	3.6	3.7	3.6	23
Dissolved Manganese	g/m ³	0.45	0.44	0.45	0.45	1.20
Dissolved Nickel	g/m ³	0.094	0.093	0.099	0.100	0.075
Dissolved Zinc	g/m ³	0.31	0.24	0.35	0.50	0.0157
Dissolved Organic Carbon (DOC)	g/m ³	0.8	0.7	0.9	0.9	< 0.5
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.018	0.019	0.023	0.019
Transmittance at 254 nm*	%T, 1 cm cell	98.7	95.9	95.7	94.8	95.7

Sample Name:		MAN Bypass T6 J3J4 7.0 19-Mar-2025 3:45 pm	MAN Bypass T6 J1J2 6.5 19-Mar-2025 3:45 pm	MAN Bypass T4 J3J4 6.0 19-Mar-2025 1:30 pm	MAN Bypass T4 J1J2 5.5 19-Mar-2025 1:30 pm	THICKEN T2J4 Supernatant ND 11-Feb-2025 10:30 am
Lab Number:		3841393.11	3841393.12	3841393.13	3841393.14	3841393.15
Turbidity	NTU	2.8	2.8	1.72	1.85	4.9
pH	pH Units	6.6	6.7	6.5	5.9	8.0
Total Alkalinity	g/m ³ as CaCO ₃	10.1	11.8	7.3	4.0	14.5
Total Hardness	g/m ³ as CaCO ₃	630	650	640	620	560
Total Suspended Solids	g/m ³	26	26	17	-	-
Dissolved Aluminium	g/m ³	0.035	0.046	0.024	0.151	0.054
Dissolved Cadmium	g/m ³	0.00033	0.00020	0.00046	0.00072	< 0.00005
Dissolved Calcium	g/m ³	210	220	220	210	210
Dissolved Chromium	g/m ³	0.0007	0.0007	0.0008	< 0.0005	0.0014
Dissolved Cobalt	g/m ³	0.045	0.028	0.059	0.080	0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0010	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	0.00014	< 0.00010
Dissolved Magnesium	g/m ³	23	23	24	25	8.4
Dissolved Manganese	g/m ³	1.47	1.26	1.60	1.72	0.0054
Dissolved Nickel	g/m ³	0.129	0.087	0.160	0.197	0.0008
Dissolved Zinc	g/m ³	0.059	0.027	0.105	0.58	< 0.0010
Dissolved Organic Carbon (DOC)	g/m ³	< 0.5	0.5	< 0.5	0.6	1.5
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.003	0.004	0.003	0.007
Transmittance at 254 nm*	%T, 1 cm cell	99.1	99.2	99.1	99.2	98.3

Sample Name:		THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am
Lab Number:		3841393.16	3841393.17	3841393.18	3841393.19	3841393.20
Turbidity	NTU	8.8	-	1.33	0.16	0.12
pH	pH Units	8.5	-	7.3	7.1	6.9
Total Alkalinity	g/m ³ as CaCO ₃	20	-	15.7	10.7	9.1
Total Hardness	g/m ³ as CaCO ₃	540	1,930	1,930	650	640
Total Suspended Solids	g/m ³	-	-	-	4	< 3
Dissolved Aluminium	g/m ³	0.35	0.083	0.006	0.76	0.158
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	200	620	620	220	210
Dissolved Chromium	g/m ³	0.0018	0.0057	0.0059	0.0008	0.0007
Dissolved Cobalt	g/m ³	< 0.0002	0.0015	0.0012	0.0035	0.0197
Dissolved Copper	g/m ³	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	8.0	93	94	25	26
Dissolved Manganese	g/m ³	0.0043	0.31	0.33	0.59	1.37
Dissolved Nickel	g/m ³	0.0006	0.0016	0.0022	0.0121	0.058
Dissolved Zinc	g/m ³	< 0.0010	0.0014	0.0068	0.0032	0.0125
Dissolved Organic Carbon (DOC)	g/m ³	15	-	1.3	0.6	< 0.5

Sample Type: Aqueous					
Sample Name:	THICKEN T4J4 Supernat 11-Feb-2025	THICKEN T6J4 S23 Supernatant 12-Feb-2025 11:00 am	THICKEN T7J2 Supernatant 12-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am
Lab Number:	3841393.16	3841393.17	3841393.18	3841393.19	3841393.20
Absorbance at 254 nm AU cm ⁻¹	0.010	-	0.019	0.015	0.039
Transmittance at 254 nm* %T, 1 cm cell	97.6	-	95.8	96.5	91.3

Sample Name:	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm				
Lab Number:	3841393.21				
Turbidity NTU	0.08				
pH pH Units	6.9				
Total Alkalinity g/m ³ as CaCO ₃	8.4				
Total Hardness g/m ³ as CaCO ₃	640				
Total Suspended Solids g/m ³	< 3				
Dissolved Aluminium g/m ³	0.24				
Dissolved Cadmium g/m ³	< 0.00005				
Dissolved Calcium g/m ³	220				
Dissolved Chromium g/m ³	0.0007				
Dissolved Cobalt g/m ³	0.0179				
Dissolved Copper g/m ³	< 0.0005				
Dissolved Iron g/m ³	< 0.02				
Dissolved Lead g/m ³	< 0.00010				
Dissolved Magnesium g/m ³	24				
Dissolved Manganese g/m ³	1.13				
Dissolved Nickel g/m ³	0.053				
Dissolved Zinc g/m ³	0.0078				
Dissolved Organic Carbon (DOC) g/m ³	< 0.5				
Absorbance at 254 nm AU cm ⁻¹	0.005				
Transmittance at 254 nm* %T, 1 cm cell	98.8				

Analyst's Comments

Sample 2 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-16, 18-21
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-16, 18-21
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-16, 18-21
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-16, 18-21
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-21
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	5-13, 19-21

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-21
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-21
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-21
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-21
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-21
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-21
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-21
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-21
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-21
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-21
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-16, 18-21
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-16, 18-21
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-16, 18-21

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

Testing was completed between 02-Apr-2025 and 09-Apr-2025. 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.

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Sample Type: Sludge		
Sample Name:		S23 (New) Test ID Sludge 31-Mar-2025
Lab Number:		3842877.1
Dry Matter	g/100g as rcvd	2.9
Total Recoverable Aluminium	mg/kg dry wt	110,000
Total Recoverable Arsenic	mg/kg dry wt	40
Total Recoverable Cadmium	mg/kg dry wt	2.3
Total Recoverable Chromium	mg/kg dry wt	57
Total Recoverable Cobalt	mg/kg dry wt	192
Total Recoverable Iron	mg/kg dry wt	91,000
Total Recoverable Lead	mg/kg dry wt	0.5
Total Recoverable Magnesium	mg/kg dry wt	23,000
Total Recoverable Manganese	mg/kg dry wt	5,400
Total Recoverable Nickel	mg/kg dry wt	530
Total Recoverable Sodium	mg/kg dry wt	148
Total Recoverable Zinc	mg/kg dry wt	3,000
Chloride*	mg/kg dry wt	340
pH	pH Units	8.44
Nitrite-N*	mg/kg dry wt	< 17
Nitrate-N*	mg/kg dry wt	28
Nitrate-N + Nitrite-N*	mg/kg dry wt	28
Sulphate*	mg/kg dry wt	17,700

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Sludge			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1
2M KCl Extraction*	2M potassium chloride extraction of as received fraction for analysis of NH4N, NO2N and NO3N. Analyst, 109, 549, (1984).	-	1



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Sludge			
Test	Method Description	Default Detection Limit	Sample No
0.02M potassium dihydrogen ortho-phosphate extraction*	(1:5) ratio of sample (g):0.02M potassium dihydrogen ortho-phosphate extractant (mL), analysis by Ion Chromatography. In House.	-	1
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2 (modified).	-	1
Total Recoverable Aluminium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	50 mg/kg dry wt	1
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	2 mg/kg dry wt	1
Total Recoverable Cadmium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	0.10 mg/kg dry wt	1
Total Recoverable Chromium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	2 mg/kg dry wt	1
Total Recoverable Cobalt	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	0.4 mg/kg dry wt	1
Total Recoverable Iron	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	40 mg/kg dry wt	1
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	0.4 mg/kg dry wt	1
Total Recoverable Magnesium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	40 mg/kg dry wt	1
Total Recoverable Manganese	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	1.0 mg/kg dry wt	1
Total Recoverable Nickel	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	2 mg/kg dry wt	1
Total Recoverable Sodium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	40 mg/kg dry wt	1
Total Recoverable Zinc	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2 (modified).	4 mg/kg dry wt	1
Chloride*	Ion Chromatography determination of a potassium phosphate extract of an environmental solid. APHA 4110 B (modified) : Online Edition.	3 mg/kg dry wt	1
pH	pH meter. APHA 4500-H ⁺ B (modified) : Online Edition.	0.10 pH Units	1
Nitrite-N*	FIA determination of 2M potassium chloride extraction on as received fraction. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	1.0 mg/kg dry wt	1
Nitrate-N*	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N.	1.5 mg/kg dry wt	1
Nitrate-N + Nitrite-N*	Automated cadmium reduction, FIA determination of 2M potassium chloride extraction on as received fraction. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	1.0 mg/kg dry wt	1
Sulphate*	Ion Chromatography determination of a potassium phosphate extract of an environmental solid. APHA 4110 B (modified) : Online Edition.	3 mg/kg dry wt	1

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

Testing was completed between 07-Apr-2025 and 11-Apr-2025. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing
ANALYTICAL REPORT

REPORT CODE

AR-24-NW-046418-01

REPORT DATE

05/08/2024

Contact for your orders:

Contract:

Submission Reference:

Contract for Graymont (NZ) Limited
Mak Oxd

Order code:

EUNZWE-00196988

Purchase Order Number:

1017166

SAMPLE CODE

812-2024-00109651

Sample Name

Makareao Oxide 13-17/7

Sample Reference

Makareao Oxide

Reception Date & Time:

02/08/2024 9:30

Analysis Started on:

03/08/2024

Analysis Ending Date:

05/08/2024

Product Type

Quicklime

Sampled Date & Time

30/07/2024 00:00

Sampler(s)

CUSTOMER

RESULTS

LOQ

NW499 Arsenic - Total

Arsenic (As)

0.34

mg/kg

0.05

NW504 Cadmium - Total

Cadmium (Cd)

0.64

mg/kg

0.01

NW507 Chromium - Total

Chromium (Cr)

8.8

mg/kg

0.2

NW509 Copper - Total

Copper (Cu)

1.3

mg/kg

0.3

NW511 Lead - Total

Lead (Pb)

0.5

mg/kg

0.1

NW515 Mercury - Total

Mercury (Hg)

<0.1

mg/kg

0.1

NW517 Nickel - Total

Nickel (Ni)

1.2

mg/kg

0.2

LIST OF METHODS

NW499 Arsenic - Total: APHA Online Edition 3125 B mod.

NW504 Cadmium - Total: APHA Online Edition 3125 B mod.

NW507 Chromium - Total: APHA Online Edition 3125 B mod.

NW509 Copper - Total: APHA Online Edition 3125 B mod.

NW511 Lead - Total: APHA Online Edition 3125 B mod.

NW515 Mercury - Total: APHA Online Edition 3125 B mod.

NW517 Nickel - Total: APHA Online Edition 3125 B mod.

Signature

Phone

www.eurofins.co.nz



Food & Water Testing



**Gabriela
Carvalho** Manager Chemistry

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received. Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

This document can only be reproduced in full.

The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

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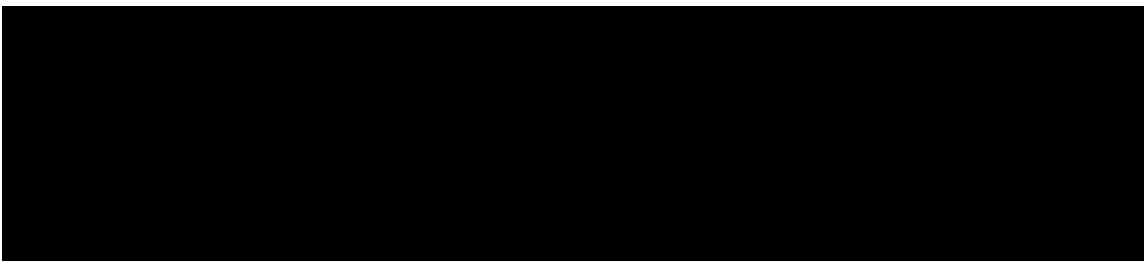
END OF REPORT



SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
Restriction of Use in NZ: Refer to Section 15



Website: www.graymont.com

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use

Supplier: Ixom Operations Pty Ltd (Incorporated in Australia)
NZBN:
Street Address:

Telephone Number:
Facsimile:
Emergency Telephone:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

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BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier

Company:

BASF Australia Limited (ABN 62 008 437 867)
Level 12, 28 Freshwater Place Southbank
Victoria 3006, AUSTRALIA
Telephone: +61 3 8855-6600
Telefax number: +61 3 8855-6511

Emergency information:

BASF Emergency Advice Number: 1800 803 440 (24h) [within Australia]
BASF Emergency Advice Number: + 61 3 8855 6666 [outside Australia]

NZ Supplier Contact Details

Chemiplas (NZ) Ltd
137 Great North Road
Grey Lynn Auckland 1021
Ph +64 9 361 4060 Fax +64 9 361 2244
24 HR Emergency Ph No.+64 9 3614061

2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

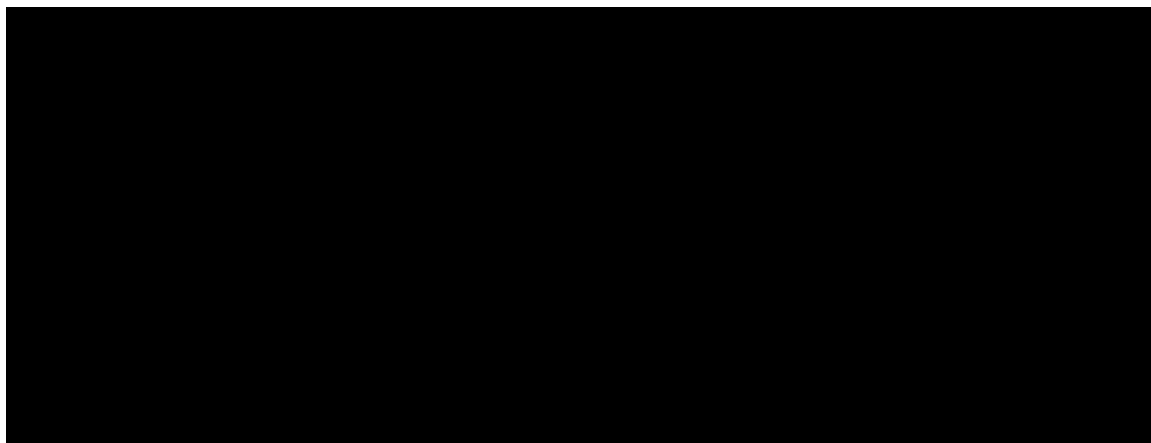
Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet



2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing. Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Melting point:	The substance / product decomposes therefore not determined.
Flash point:	not applicable
Solubility in water:	Forms a viscous solution.
Fire promoting properties:	not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:	No corrosive effect on metal.	
Formation of flammable gases:	Start temperature:	220 °C

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet

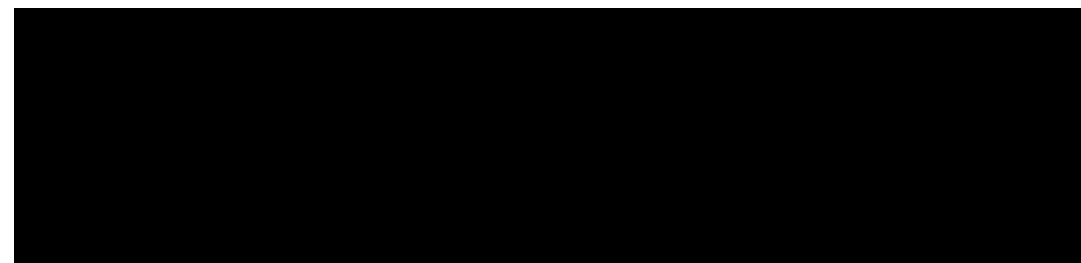


1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).
Acute toxicity: Oral LD50 (rat): >5000 mg/kg Dermal LD50 (rat): >5000 mg/kg	
Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).
Chronic effects:	
Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]

For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **SUPERFLOC B SERIES**

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.

Supplier:

NZBN:

Street Address:

Telephone Number:

Facsimile:

Emergency Telephone:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.

P264 Wash hands thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

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Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride . Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

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**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

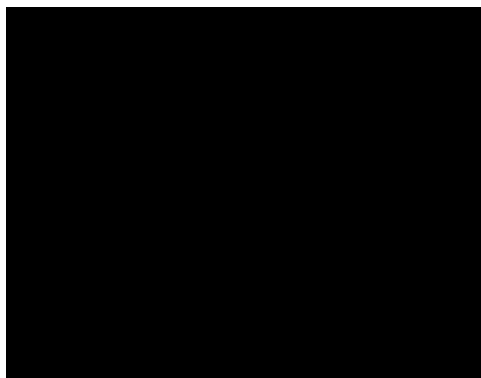
1.3. Details of the supplier of the safety data sheet

Company:

Telephone:

Telefax:

E-mail address:



1.4. Emergency telephone number

24-hour emergency number: 1 800 033 111

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix E – High Density Sludge Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRO-RPT-00006

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	Revised	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	Use	Revised with client comments			G Smith	26/03/2026

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1 HIGH DENSITY SLUDGE (HDS) TESTING

1.1 Summary

Hydroxide sludges can have low density, requiring significant dewatering prior to being used as fill onsite and able to be handled with conventional excavation machinery.

The high-density sludge process has potential to improve what can be done up front during the hydroxide precipitation and sedimentation stages of treatment to increase sludge density before dewatering.

The high-density sludge process involves mixing about 80% of the sludge obtained from the underflow from a conventional clarifier, lamella clarifier or thickener and mixing this with the incoming mine water to be treated. Recycles of 10-20 times whilst commissioning the HDS process have been suggested in literature (Coulton et al, and Mackie et al). In our testing we performed 20 sludge recycles.

The recycled sludge provides precipitation nuclei for further metal hydroxide formation. In theory, resultant sludge densities from an HDS process are considerably higher than a single pass conventional process, with solids content of 15-25 wt% possible without dewatering and 50-80 wt % after filter pressing (Younger, Banwart & Hedin 2002).

There are two main decisions in HDS design:

1. To mix the recirculated sludge with lime prior to introducing the mine water
- Or
2. To mix the sludge with the mine water prior to adding the lime

The second option is what we trialled here. It is thought to use less lime and have lower operating costs. A concern with this method is that it may be at the expense of producing a sludge that is likely to more readily release metals through leaching in the long term. (We have not investigated the sludge metal leaching aspect in our work.)

We have tested the water quality of both the HDS sludge produced and the supernatant for return to the treatment process or discharge to the environment.

1.1.1 Methodology

The following method was used in the HDS Testing:

Equipment used:

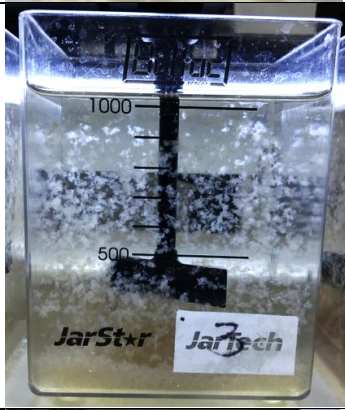
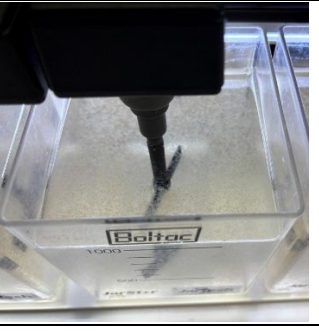
- A Boltac Infinity Jar Stirrer and four 1 litres jars were used for rapid and slow mixing process phases.
- Four x 1 litre glass graduated cylinders were used for bench settling tests.
- Hanna Bench top pH Meter for pH measurement

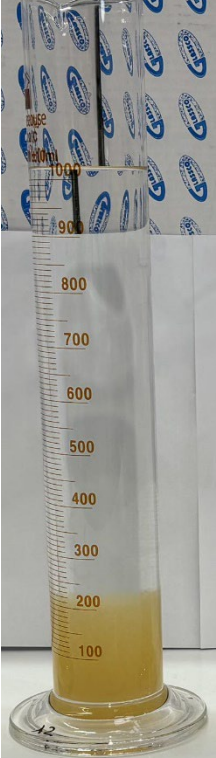
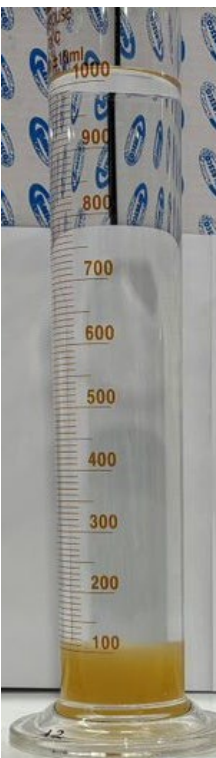
Method:

- AMD sample Manchester St Old (sampled 27.07.2024) was used for the HDS trials
- Sludge used for the initial seeding test was from the Barrel Sludge Creation trials “Manchester Sludge Test 2 and Test 6 Mix” created on 31.01.2025 (created from Manchester St New sampled in 16.01.2025)
- Coagulant MetalsorbFZ and Flocculant Rheomax 1050 were prepared to 0.1% solutions with Deionised water
- Initial seeding run – 30mL of Sludge was added to each 1L sample of AMD under rapid mix 350rpm
- CaO 20% slurry was used for neutralisation (20mins at 350RPM)
- Flocculant was added to the 1L of neutralised AMD/Sludge and further mixed at 350RPM for 1min
- Coagulant was added and further 1min rapid mix
- Slow mix was 10 mins at 20RPM
- Decanted to 1000mL Glass Cylinder and settled for 30min
- Settled distances and settled volume of sludge were recorded
- Volume and weight of sludge was recorded after decanting to calculate density
- Thickened Sludge was kept for reuse in the subsequent test run and any leftover sludge retained for further analysis.
- Initial seeding run used 30mL of Sludge from the MAN T2/T6 mix.
HDS Tests 2-20 used 100mL of recycled sludge from the previous test run

Note: for these tests we chose to not add sediment as this would likely contribute to greater variability in the densities due to sediment retention when decanting.

On a full-scale Water Treatment Plant any sediment load would contribute to potential HDS sludge densities being higher as was seen with the previous treatment column which had column sludge densities as high as 1018 g/L when sediment was included at a rate of 3 g/L.

HDS TEST 1 (26.02.2025)	BENCH T3J2 (15.08.2024)	
		Start of Test after sludge addition (Manchester Old AMD + Barrel Sludge Creation T2/T6 Sludge mix) HDS T1: 1.3mL CaO 20%, 2mL Metalsorb 0.1%, 1.5mL Rheo 1050 0.1%
		Start of Slow Mix
		End of Slow Mix (10 mins)
		HDS Test 1 - 26 February 2025 End of Slow Mix (10 mins)

HDS TEST 1 (26.02.2025)	BENCH T3J2 (15.08.2024)	
 (285 mm)	 (255 mm)	5 min settling (settled distance)
 (295 mm)	 (285 mm)	30min settling

HDS TEST 6	HDS 12	HDS 15	HDS 20	
				5 Mins Settle
				30 Mins Settle

1.1.2 Sludge Water Quality

Sludge quality was analysed at the start and end of the process, taking the initial AMD sludge used to seed the HDS process and comparing it to the sludge in the final recycle (after 20 recycles). Table 1 presents sludge quality at the start of the HDS test process as well as the sludge quality after 20 recycles.

Table 1 Sludge Quality Results - Manchester Sludge (unthickened) and HDS Test 20 Sludge

SAMPLE TYPE: AQUEOUS		STARTING AMD SLUDGE USED TO SEED HDS PROCESS	HDS SLUDGE AFTER 20 RECYCLES
	Sample Name:	Barrel T2/T6 Sludge Jan 25 Mix 31-Jan-2025	HDS Test 20 Sludge 21.03.25 21-Mar-2025
	Lab Number:	3839043.1	3839043.2
Dry Matter	g/100g as rcvd	0.28	0.31
pH	pH Units	8.9	8.3
Total Aluminium	g/m3	750	1,180
Total Arsenic	g/m3	< 0.021	< 0.021
Total Cadmium	g/m3	0.0173	0.021
Total Chromium	g/m3	0.089	0.127
Total Cobalt	g/m3	1.49	1.83
Total Iron	g/m3	173	320
Total Magnesium	g/m3	67	70
Total Manganese	g/m3	23	26
Total Nickel	g/m3	3.4	4.3
Total Zinc	g/m3	16.5	25
Chloride	g/m3	3.5	4
Nitrite-N	g/m3	< 0.10	< 0.10
Nitrate-N	g/m3	< 0.10	< 0.10
Nitrate-N + Nitrite-N	g/m3	< 0.10	< 0.10
Sulphate	g/m3	550	710
Sulphate-S	g/m3	182	240

Referring to Table 1 above comparing the initial sludge versus the sludge which has been recycled 20 times, there appears to be a general trend across all metals of accumulation in the HDS sludge i.e. Fe and Zn, SO₄, Al, Cr etc. Referring to Table 2 and 3 below, this doesn't seem to have shown up as any accumulation of metals in the supernatant between HDS Test 1 through to HDS Test 20, so these must be settling out into the sludge. Variation in results seem to be related to pH or perhaps coagulation (as indicated by the lower or higher UV Transmittance values for poor or better coagulation respectively)

The HDS process did not provide supernatants that fully complied with the modified Guideline values for metals. There was one result which complied with all parameters except aluminium GV, pH and TSS treated targets. Two results complied with all metals GVs except aluminium, and cobalt GVs and pH treated target. One result complied with all GVs except aluminium and cobalt. One result complied with everything except for cobalt and manganese GVs. Aluminium, and Cobalt were the metals that

were more difficult to achieve compliance with the GVs and this seemed to be related to pH. Further work on the HDS process to bring to pilot scale could focus on optimisation of the pH.

Table 2 shows the parameters and dosing used in HDS testing, table 3 shows the supernatant quality across various numbers of recycles.

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 2 HDS and Makeup Water Tests - Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14- Mar-2025 4:00 pm	HDS Test 20 Supernatant 21-Mar- 2025	Makeup T1 J1 J2 27- Mar-2025 2:15 pm
Hills Lab Number:		3839045.6	3841393.19	3841393.2	3841393.21	3839045.7	3839045.8
Sample		Manchester st	Manchester st	Manchester st	Manchester st	Manchester st	Manchester st
Neutralent		CaO	CaO	CaO	CaO	CaO	CaO
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax	Rheomax	Rheomax	Rheomax
Sediment added		None	None	None	None	None	None
Rapid Mix time (Neutralisation)	minutes	20	20	20	20	20	20
Rapid Mix time for coagulant addition	minutes	1	1	1	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1	1	1	1
Slow Mix Time	minutes	10	10	10	10	10	10
Settling Time	minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes
Test Vessel Size		Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre	Bench Jar 1 Litre

Table 3 Supernatant Water Quality Results HDS Tests

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	HDS Test 1 Supernatant 26-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm	HDS Test 20 Supernatant 21-Mar-2025
Turbidity	NTU	19.8	2.1	0.16	0.12	0.08	0.56
Turbidity Target	NTU		5	5	5	5	5
pH	pH Units	3.2	8.7	7.1	6.9	6.9	8
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	23	10.7	9.1	8.4	15
Total Hardness	g/m3 as CaCO3	270	640	650	640	640	660
Electrical Conductivity (EC)	mS/m	114.4					
Total Suspended Solids	g/m3	<70	14	4	< 3	< 3	4
TSS Target	g/m3		5	5	5	5	5
Dissolved Aluminium	g/m3	51	3.8	0.76	0.158	0.24	1.26
Dissolved Aluminium Chronic GV 95%	g/m3		0.30	0.22	0.18	0.18	0.31
Dissolved Aluminium Chronic GV 90%	g/m3		0.38	0.28	0.23	0.23	0.39
Dissolved Aluminium Chronic GV 80%	g/m3		0.52	0.38	0.32	0.32	0.53
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	230	220	210	220	230
Dissolved Chromium	g/m3	0.0051	0.0012	0.0008	0.0007	0.0007	0.0008
Dissolved Cobalt	g/m3	0.094	< 0.0002	0.0035	0.0197	0.0179	0.0052

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	HDS Test 1 Supernatant 26-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm	HDS Test 20 Supernatant 21-Mar-2025
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0007	0.0008	0.0007	0.0007	0.0009
Dissolved Copper Chronic GV 90%	g/m3		0.0009	0.0010	0.0009	0.0009	0.0011
Dissolved Copper Chronic GV 80%	g/m3		0.0014	0.0016	0.0014	0.0014	0.0018
Dissolved Iron	g/m3	13.2	0.02	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1	1
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	17.1	25	26	24	22
Dissolved Manganese	g/m3	1.99	0.035	0.59	1.37	1.13	0.51
Dissolved Manganese Chronic GV 95%	g/m3		1.23	1.24	1.23	1.23	1.25
Dissolved Manganese Chronic GV 90%	g/m3		1.89	1.90	1.89	1.89	1.92
Dissolved Manganese Chronic GV 80%	g/m3		3.09	3.11	3.09	3.09	3.13
Dissolved Nickel	g/m3	0.23	< 0.0005	0.0121	0.058	0.053	0.0149
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	< 0.0010	0.0032	0.0125	0.0078	0.0011

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	HDS Test 1 Supernatant 26-Feb-2025	HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm	HDS Test 20 Supernatant 21-Mar-2025
Dissolved Zinc Chronic GV 95%	g/m3		0.031	0.074	0.081	0.081	0.038
Dissolved Zinc Chronic GV 90%	g/m3		0.046	0.111	0.121	0.121	0.057
Dissolved Zinc Chronic GV 80%	g/m3		0.078	0.190	0.208	0.208	0.097
Dissolved Organic Carbon (DOC)	g/m3		< 0.5	0.6	< 0.5	< 0.5	0.7
Absorbance at 254 nm	AU cm-1	0.518	0.007	0.015	0.039	0.005	0.008
Transmittance at 254 nm	%T, 1 cm cell	30.3	98.5	96.5	91.3	98.8	98.2
Iron + Manganese		15.19	0.055	0.61	1.39	1.15	0.53
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.23	2.24	2.23	2.23	2.25

1.2 HDS Floc Settling Rates

See below graphs for comparison between settling at 5 and 30 minutes with the HDS Process and previous settling from the previous report.

Figure 1 HDS Testing - Settling at 5 and 30 mins

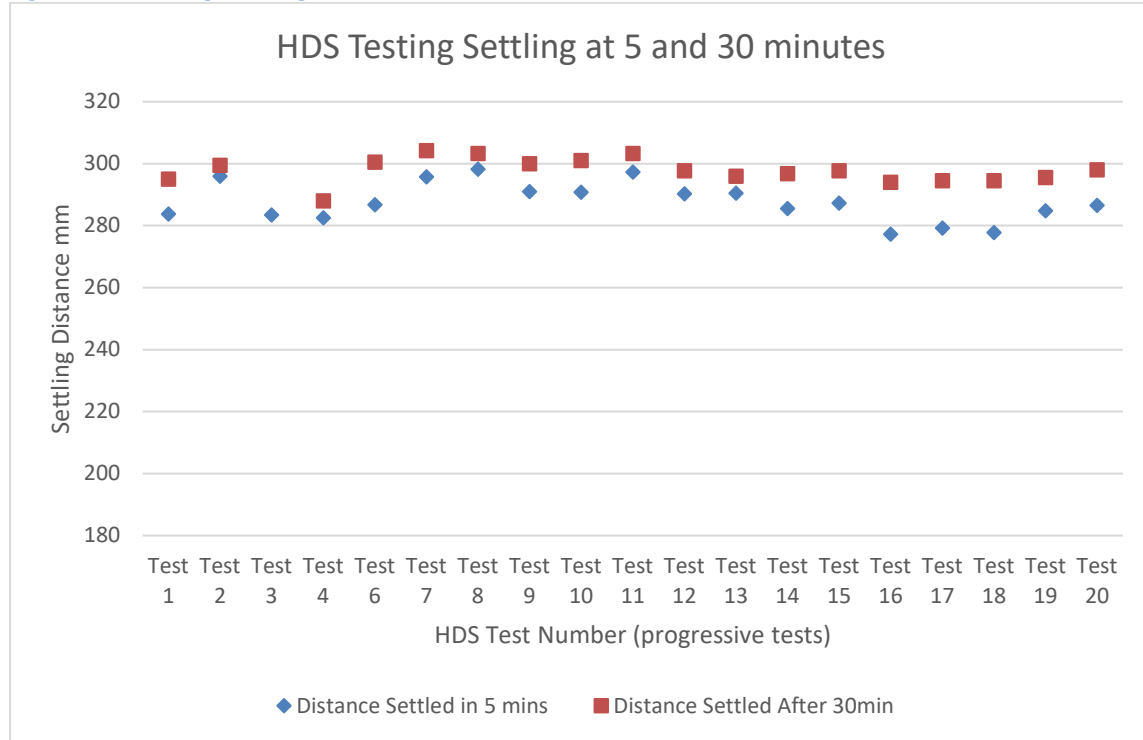
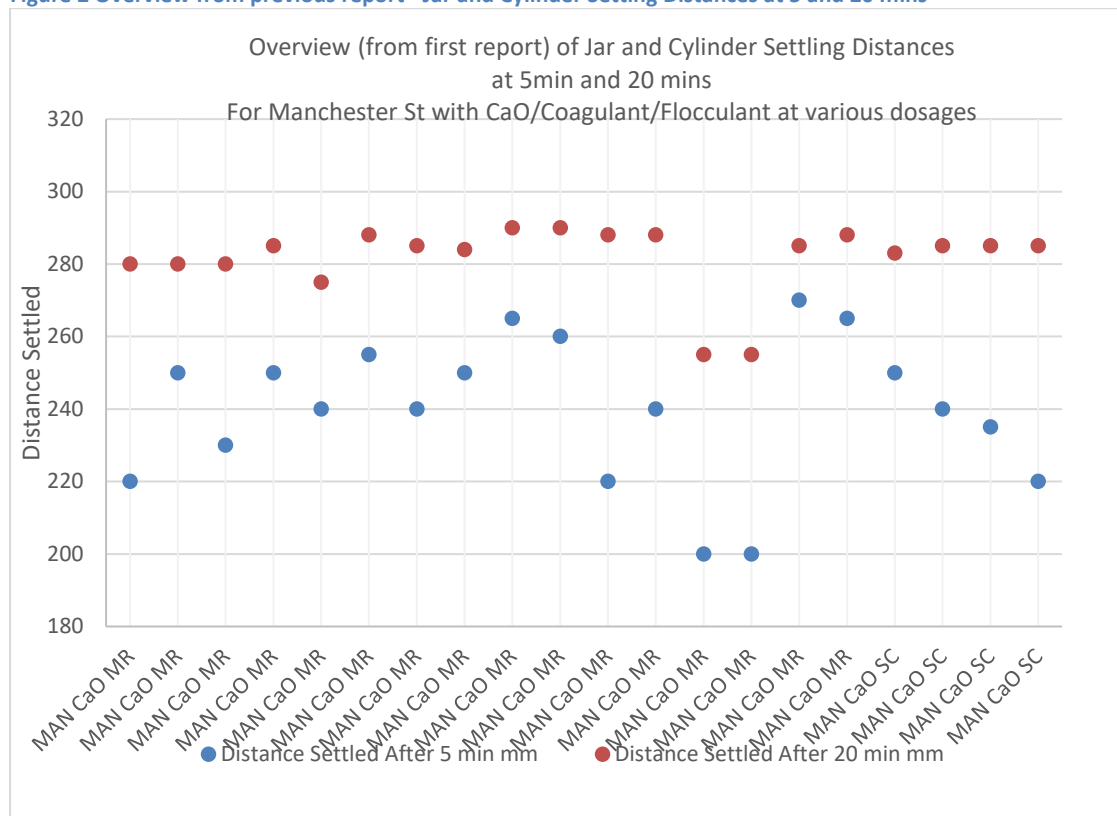


Figure 2 Overview from previous report - Jar and Cylinder Setting Distances at 5 and 20 mins



It can be seen from the settling graph comparison between HDS processed Manchester St AMD and previous processing of Manchester St AMD (Neutralisation/Coagulation and Flocculation without sludge recycle) that even in the first round of sludge recycle, the settling after 5 minutes in the HDS process is much more rapid than in the non-HDS samples. The HDS gave consistently more rapid settling than in the first 5 minutes. The tables below show that minimum, maximum and average settling rates at 5 minutes were faster for the HDS process than the AMD Treatment (without HDS from the previous work (see PFL-2408-PRO-RPT-00002)).

Table 4 HDS Manchester St AMD Settling Bench Test Rates

HDS MANCHESTER ST AMD SETTLING BENCH TEST RATES m/hr (no scaling factors applied)			
	Minimum	Maximum	Average
Calculated After 5 minutes	3.33	3.58	3.45
Calculated after 30 minutes	0.58	0.61	0.60

Table 5 AMD Manchester St Treatment Settling rates from Previous Report

AMD MANCHESTER ST TREATMENT SETTLING RATES M/HR (PREVIOUS REPORT PFL-2408-PRJ-RPT-000002)			
	Minimum	Maximum	Average
Calculated After 5 minutes	2.40	3.24	2.88
Calculated after 20 minutes	0.77	0.87	0.85

Previous settling rates from the first testing at bench and column settling scale showed that for the equivalent Manchester St AMD treatment, that the 20 minute Settlement test rate in a Bench Cylinder was 0.7-0.9 m/hr and in a Column was 4.8 m/hr (no scale factors applied) with the following process parameters:

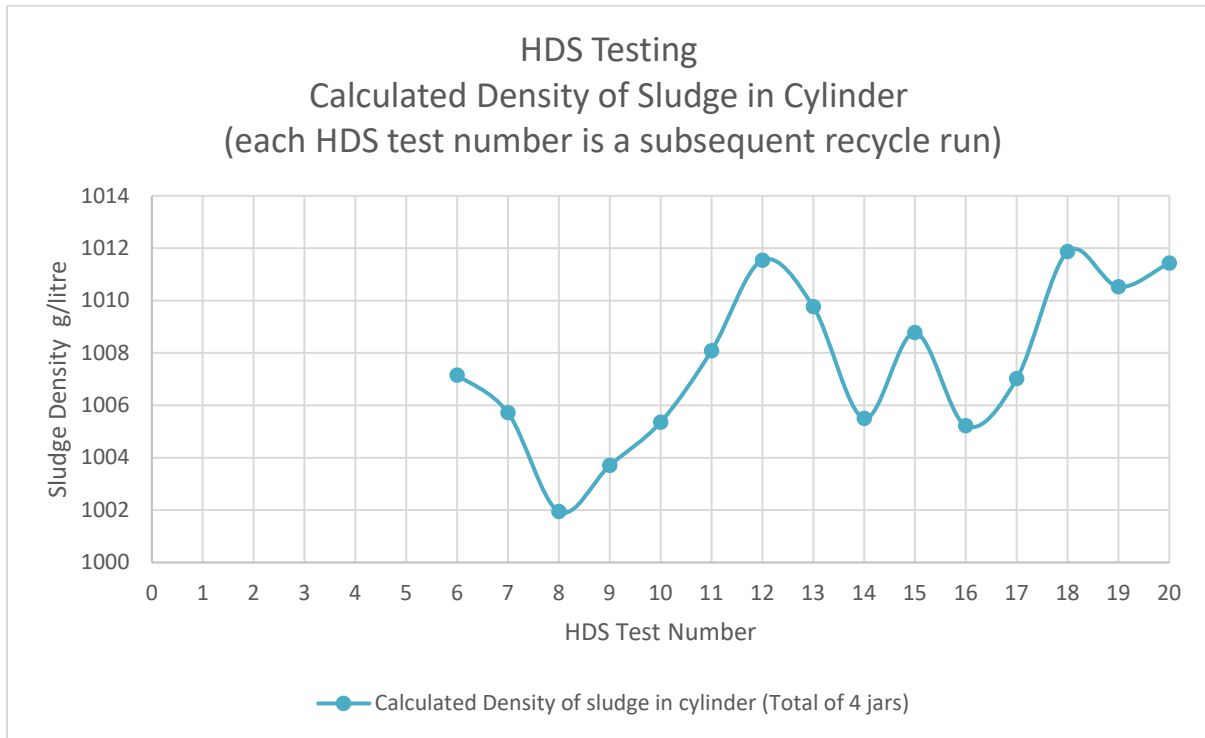
Table 6 Previous Manchester Treatment Testing Parameters from Report PFL-2408-PRO-RPT-000002

- Manchester St Raw Water Sample – Bench scale test -no sediment added
- CaO – Dosed at 260g/m3 (neutralisation time 20 minutes mixing at 350rpm)
 - Metalsorb FZA – Dosed at 2g/m3 (Flash mixed for 1 min at 350 rpm)
 - Rheomax 1050 – Dosed at 1 g/m3 (Flash mixed for 1 min at 350 rpm)
 - Slow mix time of 10 minutes at 30rpm prior to settlement.
 - Settlement time 30 minutes

The HDS testing had a 5-minute Bench cylinder settling rate higher than the previous equivalent AMD Treatment, however when calculated over 30 minutes, this was lower. Because the sludge settled quickly, in the first 5 minutes, further settlement after that was mainly sludge compression, as the cylinder bottom had been reached, so the 30-minute settling rate may not be representative of actual plant scale settling behaviour. The previous column testing allowed for more representative settling over 30 minutes due to a large settling column length. Further testing of the HDS Sludge at a column scale would give a more representative settling rate for settling time above 5 minutes.

Overall, the HDS process shows promise for increasing settling rates, and thus reducing clarifier sizing.

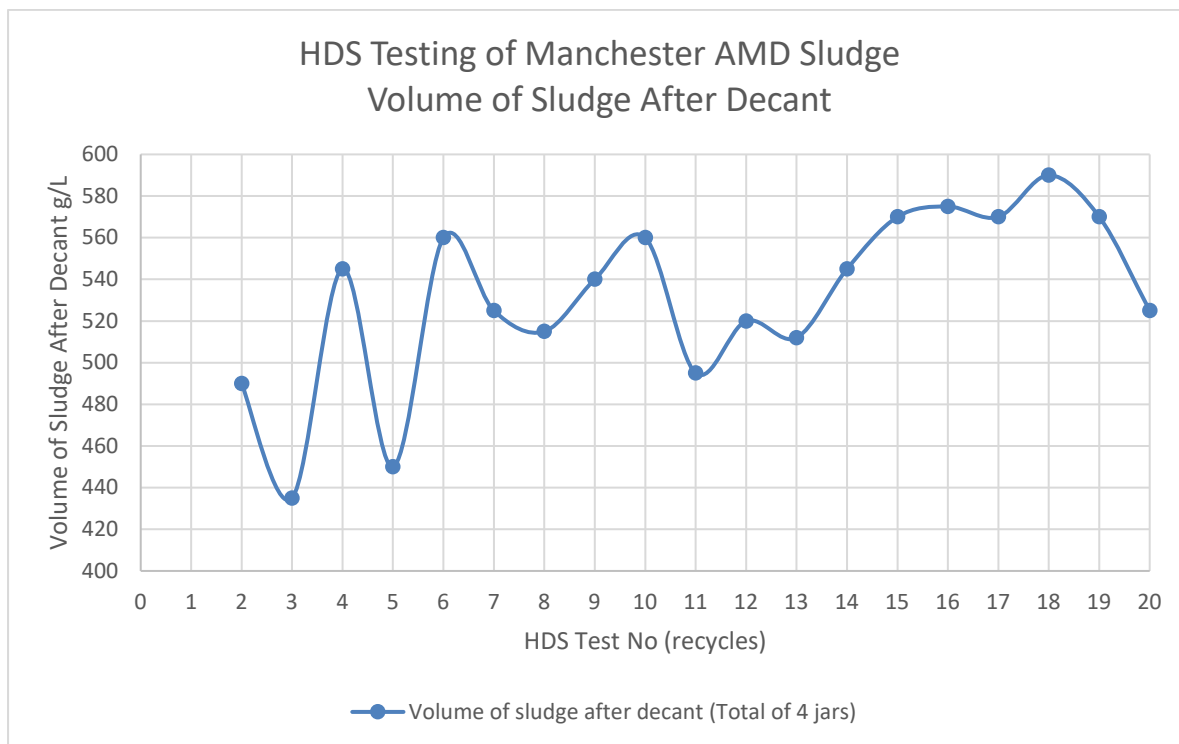
Figure 3 HDS Testing Calculated Density of Sludge in Cylinder



There appears to be an upward trend in wet density of the HDS sludge from test 5 through to 20 (Figure 3).

The graph below shows volume of sludge after decant, once supernatant has been removed. It can be seen there is a steady increase in sludge volume, with the increased number of sludge recycles. In the testing, the same volume of sludge was taken for recycle each time (100ml sludge per 1000ml jar of AMD water), and excess sludge was taken out. In the full scale WTP process this would be the sludge sent to sludge thickening and dewatering.

Figure 4 HDS Testing of Manchester AMD Sludge - Volume of Sludge after Decant

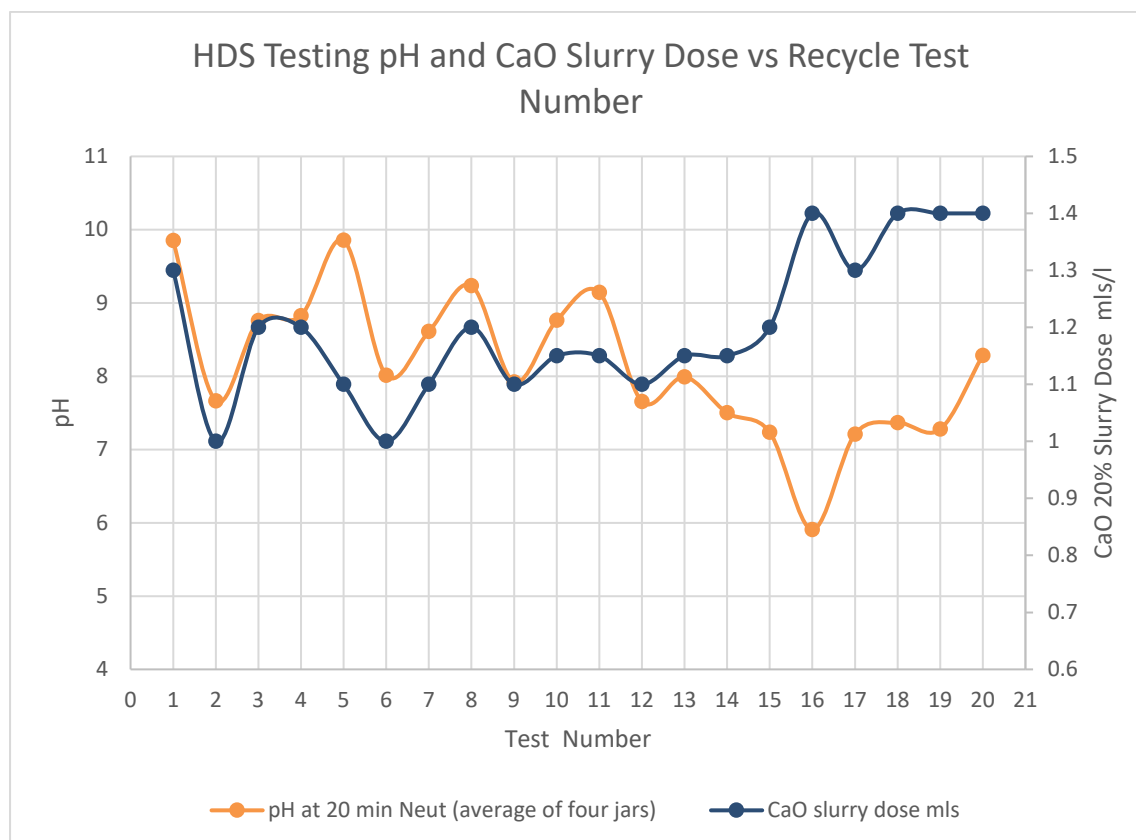


Even though the same volume of recycled sludge was added each time, the volume of sludge produced (Shown in Figure 4) increased until recycle 18, then it dropped for recycle 19 and 20, which coincided with the increase of density.

Literature has discussed that recycle of 10-20 times may be needed to set up the HDS process. In our testing it was not always clear at the point we had reached high density sludge, but cycles 19 and 20 do appear to trend towards a denser sludge.

Time limits did not allow further recycles, but if testing was repeated at a larger scale, it is recommended that further recycles are done and the volume of sludge recycled is optimised.

Figure 5 HDS Testing pH and Cao Slurry Dose versus Recycle Test Number



In the testing, the process was that the HDS sludge was put into the AMD first before the CaO slurry. In literature (Younger, Banwart & Hedin 2002) it mentions that putting the HDS sludge in first can reduce the CaO dosing requirements. We did this in Test recycles 1-15, in comparison to dosing used on the first AMD testing (PFL-2408-PRO-RPT-00002).

Literature (Minewater Hydrology, Pollution, Remediation, Paul L. Younger, Stephen A Banwart, and Robert S Hedin 2002, p292) suggests adding Sludge to the AMD prior to adding Calcium uses less Calcium but it may be at the expense of producing sludge that more readily releases metals, leaching in the long term and the other option would be to mix the recirculated sludge with Lime prior to introducing to the mine water but we did not trial this second method in our testing.

There is potential for further investigation by trialling this in the future.

In Test 1 the CaO dosing (Shown in Figure 5) was based on previous dosing with Manchester St AMD. The resulting pH was too high, potentially because of the recycled sludge raising the pH and contributing to neutralisation. We adjusted for this by reducing the dose from 1.3mls to 1 ml (a reduction in lime slurry used of 23% to get pH values of 7.3-7.9 across the four jars). Further adjustment to achieve a target pH in the mid pH 8.6-8.8 range was pursued for the rest of the testing, however but each recycle altered the pH based on the HDS sludge as well as the CaO slurry dose. At test 15 onwards, higher CaO slurry doses were needed to achieve neutralisation.

An explanation of this could be that the concentration of metals in the sludge had reached a level which was requiring more neutralisation at each recycle.

1.3 Conclusions and Recommendations

- Settling rates for HDS were better at 5 mins than for the previous AMD treatment of the same Manchester sample water.
- Sludge density had started to trend higher as the test recycled progressed
- There is potential for CaO dosing to be reduced as recycled sludge seems to be aiding neutralisation
- There seems to be a point where sludge metals concentration may be causing more difficulties for neutralisation, so this is an opportunity to optimise recycle volumes to prevent this
- Supernatant quality at the end of the cycle at Test 20, was comparable to other testing using the conventional Coagulation and Flocculation and Settling methods on Manchester St water. It complied with all metals GV except Aluminium at all LoPs and Cobalt at the 95% LoP, also pH was elevated to above the treated target. Overall, the supernatant quality did not seem to be significantly worsening in quality as sludge recycles increased.
- Trialling the combining of CaO and HDS sludge prior to adding to the AMD could be part of further trials if optimisation was required

APPENDIX A –WATER AND SLUDGE QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3839043-SP-1

3841393-SP-2-4

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



Sample Type: Aqueous

Sample Name:		Barrel T2/T6 Sludge Jan 25 Mix 31-Jan-2025	HDS Test 20 Sludge 21.03.25 21-Mar-2025
Lab Number:		3839043.1	3839043.2
Dry Matter	g/100g as rcvd	0.28	0.31
pH	pH Units	8.9	8.3
Total Aluminium	g/m ³	750	1,180
Total Arsenic	g/m ³	< 0.021	< 0.021
Total Cadmium	g/m ³	0.0173	0.021
Total Chromium	g/m ³	0.089	0.127
Total Cobalt	g/m ³	1.49	1.83
Total Iron	g/m ³	173	320
Total Magnesium	g/m ³	67	70
Total Manganese	g/m ³	23	26
Total Nickel	g/m ³	3.4	4.3
Total Zinc	g/m ³	16.5	25
Chloride	g/m ³	3.5	4.0
Nitrite-N	g/m ³	< 0.10	< 0.10
Nitrate-N	g/m ³	< 0.10	< 0.10
Nitrate-N + Nitrite-N	g/m ³	< 0.10	< 0.10
Sulphate	g/m ³	550	710
Sulphate-S*	g/m ³	182	240

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
pH	pH meter. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Aluminium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.063 g/m ³	1-2
Total Arsenic	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2



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Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Cadmium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0011 g/m ³	1-2
Total Chromium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-2
Total Cobalt	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0042 g/m ³	1-2
Total Iron	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-2
Total Magnesium	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.42 g/m ³	1-2
Total Manganese	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-2
Total Nickel	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.011 g/m ³	1-2
Total Zinc	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser, screen level. APHA 4500-NO ₂ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser, screen level. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.10 g/m ³	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Sulphate-S*	Calculation from SO ₄ .	0.2 g/m ³	1-2

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

Testing was completed between 02-Apr-2025 and 07-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:		HDS Test 6 - Supernatant 28-Feb-2025 11:45 am	HDS Test 12 - Supernatant 14-Mar-2025 9:30 am	HDS Test 15 - Supernatant 14-Mar-2025 4:00 pm
Lab Number:		3841393.19	3841393.20	3841393.21
Turbidity	NTU	0.16	0.12	0.08
pH	pH Units	7.1	6.9	6.9
Total Alkalinity	g/m ³ as CaCO ₃	10.7	9.1	8.4
Total Hardness	g/m ³ as CaCO ₃	650	640	640
Total Suspended Solids	g/m ³	4	< 3	< 3
Dissolved Aluminium	g/m ³	0.76	0.158	0.24
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	210	220
Dissolved Chromium	g/m ³	0.0008	0.0007	0.0007
Dissolved Cobalt	g/m ³	0.0035	0.0197	0.0179
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	25	26	24
Dissolved Manganese	g/m ³	0.59	1.37	1.13
Dissolved Nickel	g/m ³	0.0121	0.058	0.053
Dissolved Zinc	g/m ³	0.0032	0.0125	0.0078
Dissolved Organic Carbon (DOC)	g/m ³	0.6	< 0.5	< 0.5
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.039	0.005
Transmittance at 254 nm*	%T, 1 cm cell	96.5	91.3	98.8

Analyst's Comments

This certificate of analysis contains information extracted from 3841393-SPv2 issued on 09-Apr-2025 at 4:01 pm.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	19-21
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	19-21
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	19-21



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Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	19-21
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	19-21
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	19-21
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	19-21
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	19-21
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	19-21
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	19-21
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	19-21
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	19-21
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	19-21
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	19-21
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	19-21
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	19-21
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	19-21
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	19-21
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	19-21
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	19-21
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	19-21
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	19-21

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

Testing was completed between 03-Apr-2025 and 08-Apr-2025. 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.

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APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE AR-24-NW-046418-01 REPORT DATE 05/08/2024

Attention

Contact for your orders: [REDACTED] **Order code:** EUNZWE-00196988
Contract: Contract for Graymont (NZ) Limited
Submission Reference: Mak Oxd **Purchase Order Number:** 1017166

SAMPLE CODE 812-2024-00109651

Sample Name Makareao Oxide 13-17/7
Sample Reference Makareao Oxide
Reception Date & Time: 02/08/2024 9:30
Analysis Started on: 03/08/2024 **Analysis Ending Date:** 05/08/2024
Product Type Quicklime **Sampled Date & Time** 30/07/2024 00:00
Sampler(s) CUSTOMER

RESULTS LOQ

NW499 Arsenic - Total			
Arsenic (As)	0.34	mg/kg	0.05
NW504 Cadmium - Total			
Cadmium (Cd)	0.64	mg/kg	0.01
NW507 Chromium - Total			
Chromium (Cr)	8.8	mg/kg	0.2
NW509 Copper - Total			
Copper (Cu)	1.3	mg/kg	0.3
NW511 Lead - Total			
Lead (Pb)	0.5	mg/kg	0.1
NW515 Mercury - Total			
Mercury (Hg)	<0.1	mg/kg	0.1
NW517 Nickel - Total			
Nickel (Ni)	1.2	mg/kg	0.2

LIST OF METHODS

NW499 Arsenic - Total: APHA Online Edition 3125 B mod.	NW504 Cadmium - Total: APHA Online Edition 3125 B mod.
NW507 Chromium - Total: APHA Online Edition 3125 B mod.	NW509 Copper - Total: APHA Online Edition 3125 B mod.
NW511 Lead - Total: APHA Online Edition 3125 B mod.	NW515 Mercury - Total: APHA Online Edition 3125 B mod.
NW517 Nickel - Total: APHA Online Edition 3125 B mod.	

Signature

Food & Water Testing

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received. Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT

SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15

New Zealand Supplier:
 Address:

Telephone:

Emergency No:
Website:

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

Disclaimer

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

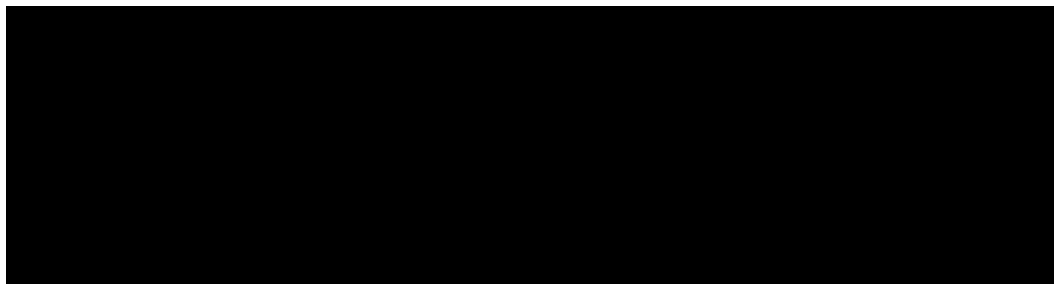
Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

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Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

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Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

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Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

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BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier

Company:

BASF Australia Limited (ABN 62 008 437 867)
Level 12, 28 Freshwater Place Southbank
Victoria 3006, AUSTRALIA
Telephone: +61 3 8855-6600
Telefax number: +61 3 8855-6511

Emergency information:

BASF Emergency Advice Number: 1800 803 440 (24h) [within Australia]
BASF Emergency Advice Number: + 61 3 8855 6666 [outside Australia]

NZ Supplier Contact Details

Chemiplas (NZ) Ltd
137 Great North Road
Grey Lynn Auckland 1021
Ph +64 9 361 4060 Fax +64 9 361 2244
24 HR Emergency Ph No.+64 9 3614061

2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

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BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form: powder

Colour: off-white

Odour: odourless

Melting point:

The substance / product decomposes
therefore not determined.

Flash point:

not applicable

Solubility in water: Forms a viscous solution.

Fire promoting properties: not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals: No corrosive effect on metal.

Formation of Start temperature: 220 °C

flammable gases:

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet

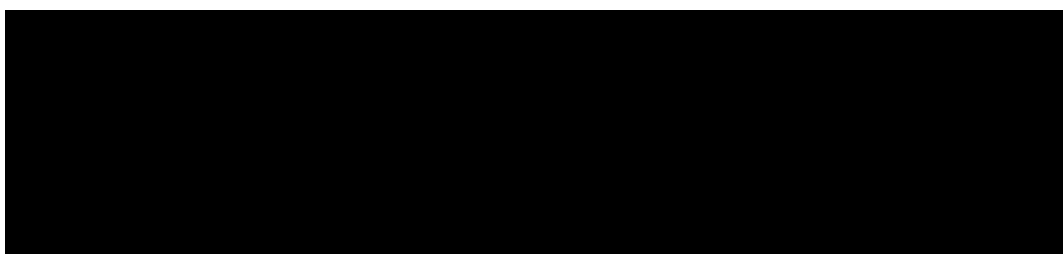


1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
--------------------	--------------------------------

Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

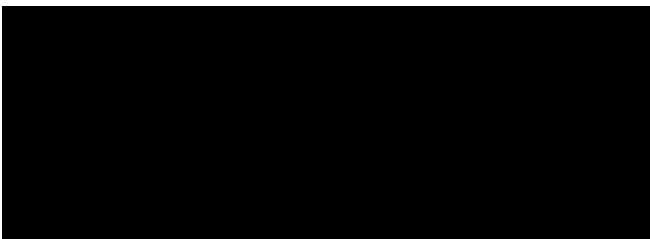
Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet



For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: SUPERFLOC B SERIES

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

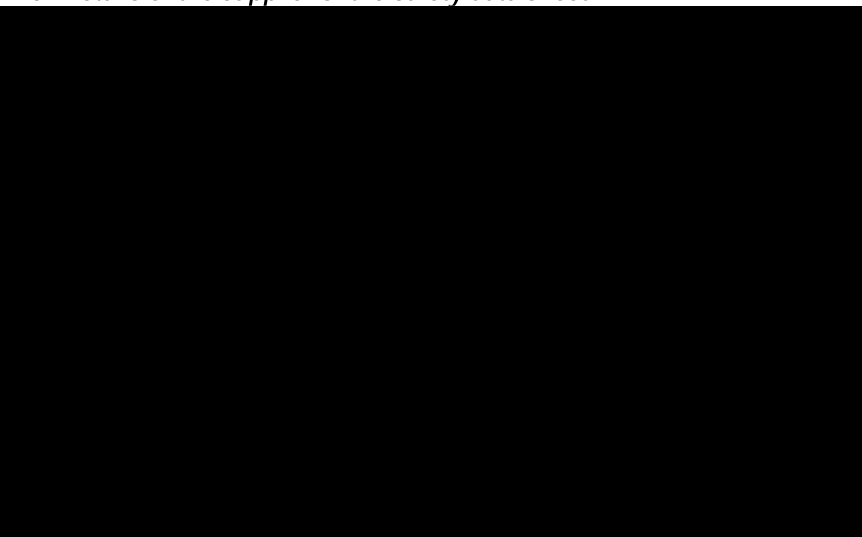
Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet



Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix F – Chemical Makeup Water Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRO-RPT-00007

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	Revised	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	Use	Updated following client comments			G Smith	26/03/2026

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1 CHEMICAL MAKEUP WATER TESTING

Bench Scale testing was carried out using Supernatant water as a makeup water in place of Deionised water to determine the suitability of Supernatant as a makeup water for water treatment at the WTP. This testing was carried out at Process Flow on 27th March 2025.

Methodology during the AMD Treatment testing involved the making up of chemical reagents in solution, such as coagulants, flocculants and CaO and MgO slurries. For the testing work, deionised water was used for chemical solution makeup, to prevent any chemical being added to the solution that may have interfered with the reactions.

On a full plant scale and in situ at the mine site, a high-quality service water source for chemical solution makeup may not be available and supernatant from the AMD Water treatment process will most likely be used. Therefore, a replicate treatment run test was done, using chemical solutions made up with supernatant from Barrel Sludge Test 2.

1.1 Method

Bench Scale testing was carried out using Supernatant from the Sludge Creation Barrel Test 2 on 30 January 2025.

Sludge Creation Barrel Test 2 was prepared with “Manchester Raw New AMD” (sampled at Manchester St on 16.01.2025) and using CaO/Metalsorb/Rheomax 1050 and no added sediment.

When using the Supernatant as Makeup Water, the reagents appeared to behave the same as when they were prepared using Deionised Water.

The reagents were prepared with Supernatant Makeup Water as follows:

1. CaO 20% Slurry prepared using 80g Graymont CaO and 400mL of Supernatant from the Barrel T2
2. Metalsorb 0.1% solution prepared using 1L of Supernatant from the Barrel T2 and 1 mL of Metalsorb concentrate
3. Rheomax 0.1% solution prepared using 1 L or Supernatant from Barrel T2 and 1g of Rheomax 1050 powder.

The Bench Scale Makeup Water Jar Test was carried out using the following procedure and doses:

1. 1L Manchester St Raw Old AMD (sampled 27 July 2024)
2. 1.3mL/L CaO 20% Slurry made up with Supernatant
3. 20 mins Neutralisation @ 350rpm
4. 2mL/L Metalsorb 0.1% Solution made up with Supernatant continue 1min 350rpm
5. 1mL/L Rheomax 1050 0.1% solution made up with Supernatant continue a min 350rpm
6. 10min slow mix at 20 rpm
7. 30mins settling in 1L glass cylinders
8. Decant supernatant for water quality testing

1.2 Results

Supernatant quality of makeup Barrel T2 Man AMD Supernatant water compared well with previous best Manchester supernatants and so was used as the makeup water.

The AMD treatment replicate tests, performed with the chemicals made up with supernatant water showed similar treated water quality to other treated supernatants, see Table 2 below. The makeup water test results for T1J1 had elevated cobalt levels which did not meet the 95% LoP chronic guideline value, and did not meet all the LoP aluminium GVs. The pH and TSS treated targets were not met either, with these being slightly elevated.

As with the other Treated water supernatant results, pH seems to be affecting whether aluminium or cobalt/nickel is reduced to below the modified Guideline Values for metals.

Overall, at this stage it appears that the treated supernatant from the proposed AMD Treatment process would be suitable for chemical makeup at the WTP as it has not significantly altered the treated water compared to other tests of treated AMD.

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 1 Chemical Makeup Water Test Process parameters for Neutralisation, Coagulation, Flocculation and 30 mins settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel MAN Test 2 Supernatant 30-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm	Makeup T1 J1 J2 27- Mar-2025 2:15 pm
Hills Lab Number:		3839045.2	3668046.3	3839045.8
Sample		Manchester St New	Manchester st	Manchester st
Neutralent		CaO	CaO	CaO
Coagulant			Metalsorb	Metalsorb
Flocculant		Metalsorb	Rheomax	Rheomax
Sediment added		Rheomax	0.3g/l	None
Rapid Mix time (Neutralisation)	minutes	None	20	20
Rapid Mix time for coagulant addition	minutes	20	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1
Slow Mix Time	minutes	1	10	10
Settling Time	minutes	10	30 minutes	30 minutes
Test Vessel Size		30 minutes	Bench Jar 1 Litre	Bench Jar 1 Litre

Table 2 Chemical Makeup Water Test Quality Comparison for Neutralisation, Coagulation, Flocculation and 30 mins settling

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Turbidity	NTU	19.8	16.8	2.1	0.86	3.3
Turbidity Target	NTU			5	5	5
pH	pH Units	3.2	3.1	7.9	7.7	7.7
pH Target	pH Units			4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	< 1.0	14.8	14.7	13.4
Total Hardness	g/m3 as CaCO3	270	197	510	630	630
Electrical Conductivity (EC)	mS/m	114.4	103.7			
Total Suspended Solids	g/m3	<70	17	9	5	7
TSS Target	g/m3			5	58	5
Dissolved Aluminium	g/m3	51	46	1.67	0.93	0.94
Dissolved Aluminium Chronic GV 95%	g/m3			0.24	0.48	0.23
Dissolved Aluminium Chronic GV 90%	g/m3			0.30	0.61	0.29
Dissolved Aluminium Chronic GV 80%	g/m3			0.42	0.83	0.39
Dissolved Cadmium	g/m3	0.00081	0.00082	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3			0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3			0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3			0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	53	183	220	220
Dissolved Chromium	g/m3	0.0051	0.0042	0.0009	< 0.0005	0.0008
Dissolved Cobalt	g/m3	0.094	0.085	0.0007	0.0026	0.0044
Dissolved Cobalt Chronic GV 95%	g/m3			0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3			0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3			0.0208	0.0208	0.0208

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	T14S2-MAN 26-Aug-2024 4:00 pm	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Dissolved Copper	g/m3	0.0133	0.0148	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3			0.0007	0.0016	0.0007
Dissolved Copper Chronic GV 90%	g/m3			0.0009	0.0020	0.0009
Dissolved Copper Chronic GV 80%	g/m3			0.0014	0.0032	0.0014
Dissolved Iron	g/m3	13.2	3.5	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3			1.0	1.0	1
Dissolved Lead	g/m3	0.00136	0.00159	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	15.6	13.4	22	21
Dissolved Manganese	g/m3	1.99	1.41	0.158	0.49	0.58
Dissolved Manganese Chronic GV 95%	g/m3			1.12	1.22	1.22
Dissolved Manganese Chronic GV 90%	g/m3			1.72	1.88	1.88
Dissolved Manganese Chronic GV 80%	g/m3			2.81	3.07	3.07
Dissolved Nickel	g/m3	0.23	0.2	0.0032	0.0115	0.0189
Dissolved Nickel Chronic GV 95%	g/m3			0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3			0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3			0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	0.99	< 0.0010	< 0.0010	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3			0.036	0.067	0.042
Dissolved Zinc Chronic GV 90%	g/m3			0.054	0.100	0.063
Dissolved Zinc Chronic GV 80%	g/m3			0.092	0.172	0.109
Dissolved Organic Carbon (DOC)	g/m3		0.8	< 0.5	1.6	0.5
Absorbance at 254 nm	AU cm-1	0.518	0.109	0.013	0.013	0.008
Transmittance at 254 nm	%T, 1 cm cell	30.3		97.1	97.1	98.1
Iron + Manganese		15.19	4.91	0.178	0.51	0.6

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	T14S2-MAN 26-Aug- 2024 4:00 pm	Makeup T1 J1 J2 27- Mar-2025 2:15 pm
Dissolved Iron + Manganese Chronic GV 80%/90%/95%				2.12	2.22	2.22

Figure 1 Supernatant used for Makeup Water from Sludge Creation Barrel Test 2



Figure 2 Floc Formation at end of Slow Mix - Makeup Water Testing



Figure 3 Makeup Water Testing - 5 mins settling

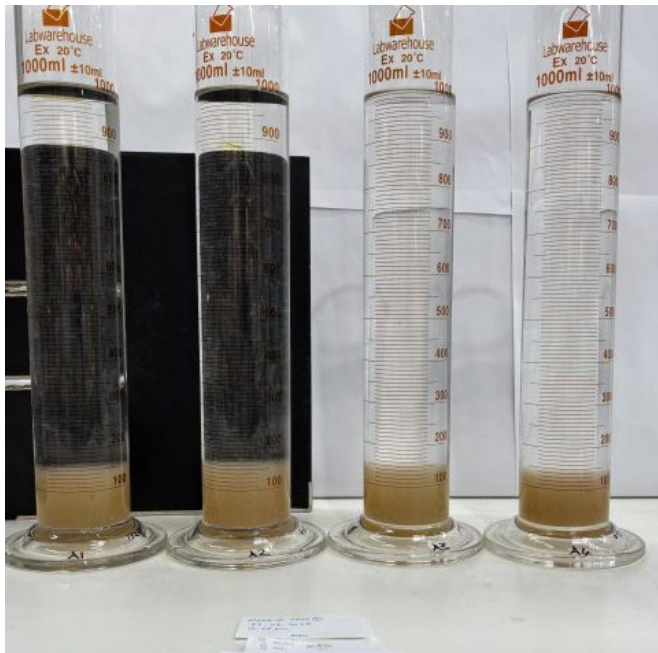


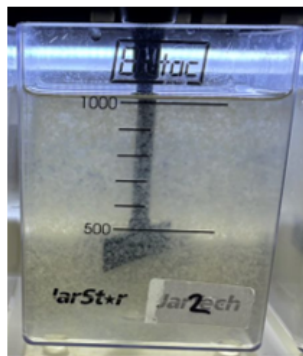
Figure 4 Makeup Water Testing - 30 mins settling

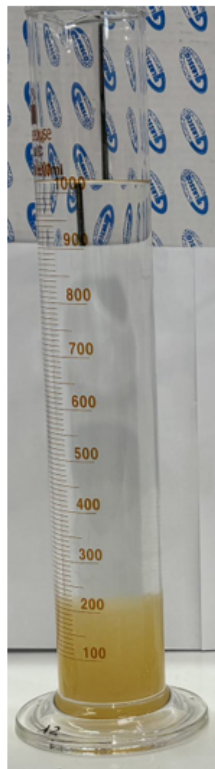
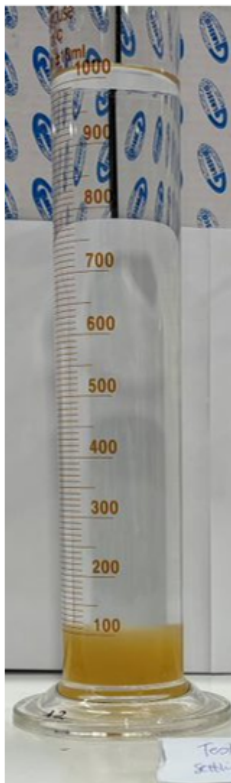


Figure 5 Comparable Tests From Previous Report PFL-2408-PRO-RPT-000002 - Water Testing Report RevA – Manchester St CaO No Sediment with Metalsorb/Rheomax treatment.

TEST	RAW WATER	NEUTRALENT	COAGULANT / CHELATING AGENT	FLOCCULANT
Bench T3J2	Manchester St (No sediment)	1.3mL/L of 20% slurry Dose 260g/m ³ CaO	2mL/L of 0.1% <u>soln</u> Dose 2g/m ³ <u>Metalsorb</u>	1mL/L of 0.1% <u>soln</u> Dose 1 g/m ³ Rheomax
Column T1C1	Manchester St (No sediment)	1.3mL/L of 20% slurry Dose 260 g/m ³ CaO	2mL/L of 0.1% <u>soln</u> Dose 2g/m ³ <u>Metalsorb</u>	1 mL/L of 0.1% <u>soln</u> Dose 1 g/m ³ Rheomax

END OF SLOW MIX (10 MINS) (JAR)



BENCH CYLINDER SETTLING AFTER 5 MINS	BENCH CYLINDER SETTLING AFTER 30 MINS	COLUMN SETTling AFTER 5 MINS	COLUMN SETTling AFTER 30 MINS
			

APPENDIX A –WATER QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3668046-SP-2

3839044-SP-1

3839045-SP-1

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

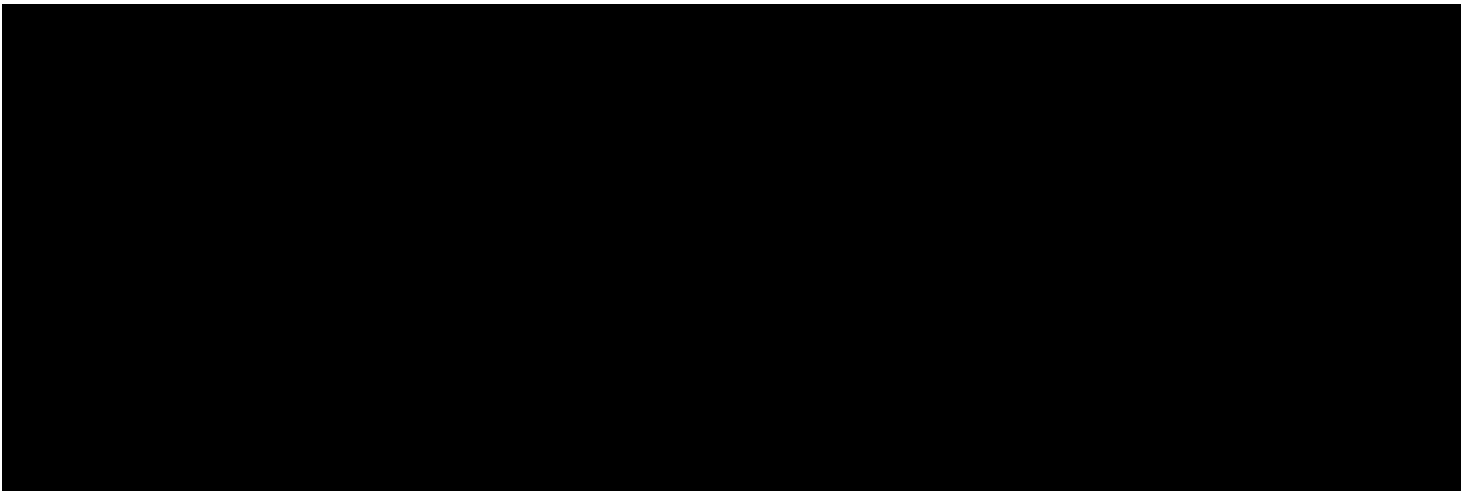
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

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**Sample Type: Aqueous**

Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Hardness	g/m ³ as CaCO ₃	640	2,300	630	2,200	200
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Hardness	g/m ³ as CaCO ₃	650	650	640	630	640
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24



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Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Hardness	g/m ³ as CaCO ₃	2,200	2,200	196	197	620
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Hardness	g/m ³ as CaCO ₃	630	2,100	2,200	210	210
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments

Sample 20 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces report '3668046-SPv1' issued on 17-Sep-2024 at 2:08 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Jun-2025. 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.

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Sample Type: Aqueous

Sample Name:		S23 New Jan 25 16-Jan-2025	Manchester St New Raw Jan 25 30-Jan-2025
Lab Number:		3839044.1	3839044.2
Individual Tests			
True Hazen Colour	Hazen units	< 10	< 10
Turbidity	NTU	1.08	16.8
pH	pH Units	2.6	3.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	1,970	350
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	1,110	197
Electrical Conductivity (EC)	mS/m	381	103.7
Total Suspended Solids	g/m ³	5	17
Total Solids (TS)	g/m ³	4,400	770
Dissolved Aluminium	g/m ³	220	46
Dissolved Calcium	g/m ³	199	53
Dissolved Cobalt	g/m ³	0.36	0.085
Dissolved Iron	g/m ³	170	3.5
Dissolved Magnesium	g/m ³	150	15.6
Dissolved Manganese	g/m ³	11.6	1.41
Dissolved Mercury	g/m ³	< 0.002	< 0.002
Total Sodium	g/m ³	3.8	3.6
Chloride	g/m ³	5.4	3.6
Sulphate	g/m ³	3,100	540
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.8
Total Organic Carbon (TOC)	g/m ³	1.8	2.0
Absorbance at 254 nm	AU cm ⁻¹	6.31	0.109
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn			
Dissolved Arsenic	g/m ³	0.066	< 0.0010
Dissolved Cadmium	g/m ³	0.0037	0.00082
Dissolved Chromium	g/m ³	0.107	0.0042
Dissolved Copper	g/m ³	0.084	0.0148
Dissolved Lead	g/m ³	< 0.0010	0.00159
Dissolved Nickel	g/m ³	1.02	0.20
Dissolved Zinc	g/m ³	5.8	0.99



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m ³	1-2
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-2
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-2
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-2
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-2
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-2
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-2
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-2
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-2
Dissolved Mercury	Filtered sample, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.002 g/m ³	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-2

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

Testing was completed between 01-Apr-2025 and 07-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:		Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 523 New Supernatant 31-Jan-2025
Lab Number:		3839045.1	3839045.2	3839045.3	3839045.4	3839045.5
Turbidity	NTU	3.2	2.1	1.23	1.59	12.8
pH	pH Units	8.0	7.9	10.9	9.7	7.4
Total Alkalinity	g/m ³ as CaCO ₃	17.8	14.8	102	48	15.5
Total Hardness	g/m ³ as CaCO ₃	620	510	580	520	1,930
Total Suspended Solids	g/m ³	26	9	6	15	118
Dissolved Aluminium	g/m ³	1.50	1.67	14.9	7.7	0.096
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	183	230	210	600
Dissolved Chromium	g/m ³	0.0013	0.0009	0.0013	0.0012	0.0041
Dissolved Cobalt	g/m ³	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	12.8	13.4	0.08	0.56	107
Dissolved Manganese	g/m ³	0.0018	0.158	< 0.0005	< 0.0005	0.31
Dissolved Nickel	g/m ³	< 0.0005	0.0032	< 0.0005	< 0.0005	0.0009
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Organic Carbon (DOC)	g/m ³	0.6	< 0.5	0.6	< 0.5	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.013	0.004	0.015	0.014
Transmittance at 254 nm*	%T, 1 cm cell	98.5	97.1	99.1	96.6	96.8

Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Turbidity	NTU	2.1	0.56	3.3
pH	pH Units	8.7	8.0	7.7
Total Alkalinity	g/m ³ as CaCO ₃	23	15.0	13.4
Total Hardness	g/m ³ as CaCO ₃	640	660	630
Total Suspended Solids	g/m ³	14	4	7
Dissolved Aluminium	g/m ³	3.8	1.26	0.94
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	230	220
Dissolved Chromium	g/m ³	0.0012	0.0008	0.0008
Dissolved Cobalt	g/m ³	< 0.0002	0.0052	0.0044
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	17.1	22	21



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Sample Type: Aqueous				
Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Dissolved Manganese	g/m³	0.035	0.51	0.58
Dissolved Nickel	g/m³	< 0.0005	0.0149	0.0189
Dissolved Zinc	g/m³	< 0.0010	0.0011	< 0.0010
Dissolved Organic Carbon (DOC)	g/m³	< 0.5	0.7	0.5
Absorbance at 254 nm	AU cm ⁻¹	0.007	0.008	0.008
Transmittance at 254 nm*	%T, 1 cm cell	98.5	98.2	98.1

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-8
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-8
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-8
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-8
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-8
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-8
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-8
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-8
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-8
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-8
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-8
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-8
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-8
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-8

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

Testing was completed between 03-Apr-2025 and 11-Apr-2025. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-24-NW-046418-01	REPORT DATE	05/08/2024

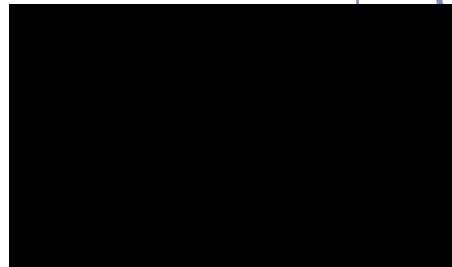
Contact for your orders:		Order code:	EUNZWE-00196988
Contract:	Contract for Graymont (NZ) Limited		
Submission Reference:	Mak Oxd	Purchase Order Number:	1017166
SAMPLE CODE	812-2024-00109651		
Sample Name	Makareao Oxide 13-17/7		
Sample Reference	Makareao Oxide		
Reception Date & Time:	02/08/2024 9:30		
Analysis Started on:	03/08/2024	Analysis Ending Date:	05/08/2024
Product Type	Quicklime	Sampled Date & Time	30/07/2024 00:00
Sampler(s)	CUSTOMER		

RESULTS			LOQ
NW499	Arsenic - Total		
	Arsenic (As)	0.34	mg/kg
			0.05
NW504	Cadmium - Total		
	Cadmium (Cd)	0.64	mg/kg
			0.01
NW507	Chromium - Total		
	Chromium (Cr)	8.8	mg/kg
			0.2
NW509	Copper - Total		
	Copper (Cu)	1.3	mg/kg
			0.3
NW511	Lead - Total		
	Lead (Pb)	0.5	mg/kg
			0.1
NW515	Mercury - Total		
	Mercury (Hg)	<0.1	mg/kg
			0.1
NW517	Nickel - Total		
	Nickel (Ni)	1.2	mg/kg
			0.2

LIST OF METHODS			
NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature

Food & Water Testing



EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received. Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

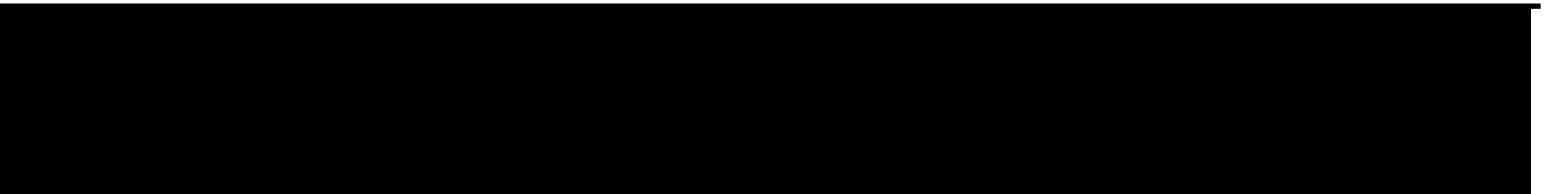
The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT



SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15

New Zealand Supplier:
 Address:

Telephone:

Emergency No:
Website:

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

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BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

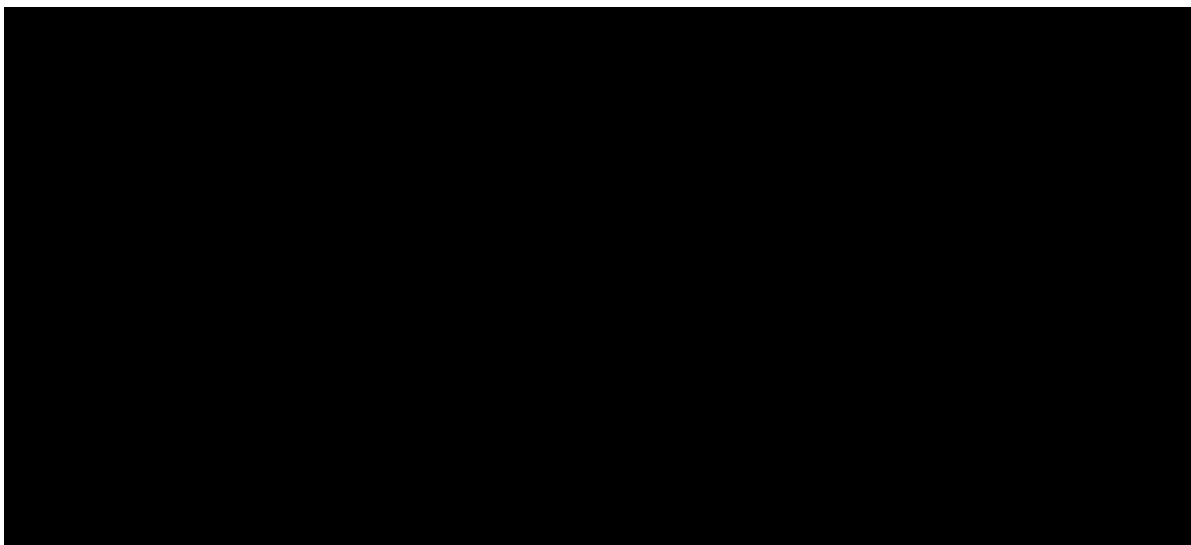
(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier



2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet



Emergency telephone number

International emergency number:

Telephone: +49 180 2273-112

2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing. Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Melting point:	The substance / product decomposes therefore not determined.
Flash point:	not applicable
Solubility in water:	Forms a viscous solution.
Fire promoting properties:	not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:	No corrosive effect on metal.	
Formation of flammable gases:	Start temperature:	220 °C

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet

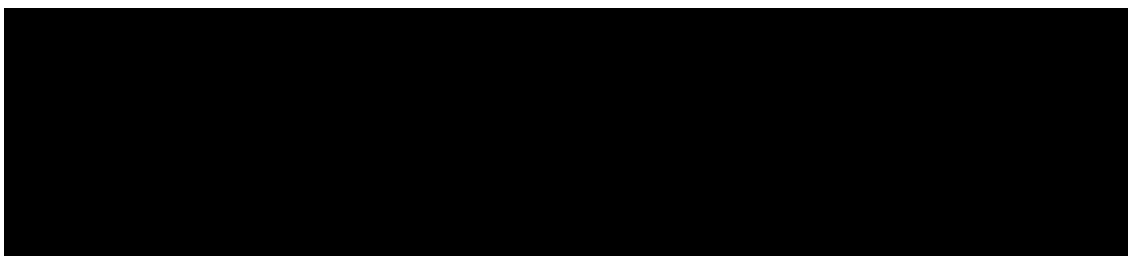


1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

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Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet

[REDACTED]

[REDACTED]

For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet

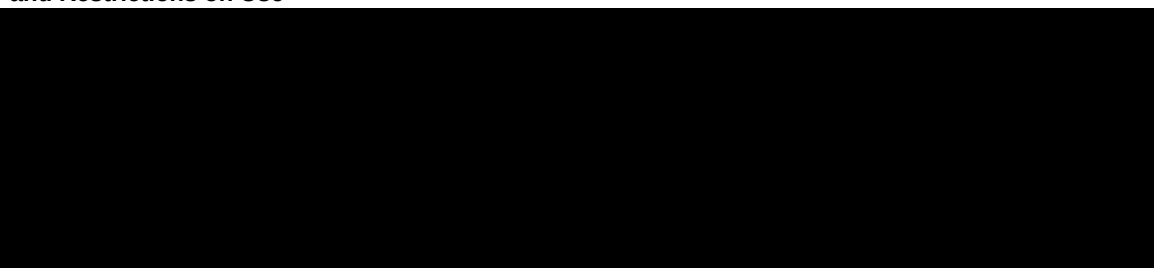


1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **SUPERFLOC B SERIES**

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

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Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix G – MgO Slaking and Dosing Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRJ-RPT-00008

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	Revised	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	Use	Updated following client comments			G Smith	26/03/2026

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1 MAGNESIUM OXIDE SLAKING AND DOSING TRIAL

1.1 Summary

Initial trials of MgO testing (by PFL) of neutralisation in combination with coagulant and flocculants as reported in **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0** showed that treatment with MgO provided inferior settling than the Calcium Oxide neutralised water.

This portion of work was to determine if there could be an improvement in settling speed and water quality results as the MgO has potential for a denser sludge which would be beneficial in post WTP sludge handling on site.

Results showed that some compliant settled supernatants were achieved using MgO as a neutralent, in combination with Metalsorb as a coagulant and Rheomax1050 as a flocculant, however the settling period was 24 hours to achieve these results. Slaking trials showed that slaking to an ideal slurry was not achieved at 10% MgO concentration using makeup water temperatures of between 20-65°. However, there were distinct results with better quality with Farmguard at high temperature of slaking. The EMag45 was less temperature dependant.

Four Verum reports on MgO/CaO testing were reviewed:
Reports November 2023, 23-000653, May2024, 24-000768,

Items we saw that have not fully been addressed from a process perspective, that we would want to test for, to see if we could improve or speed up the MgO neutralisation stage and improve reactivity of the MgO would be the following:

1. Explore hydration and slaking of MgO, mixing times and speeds to improve hydration and potentially neutralisation time, optimising amount of water, temperature of water

Time constraints have allowed for one mixing time and one mixing speed in our work, with four different temperatures of slaking water trialled.

3. Hydration for 10% slurry (used by Verum) vs 20% slurry (our previous testing) trying unsaturated solution strengths too

10 % Slurry was used in our February 2025 testing to compare with previous 2024 testing using 20% slurry. We did not trial unsaturated solution strengths.

4. Trial different speeds of rapid mix for neutralisation
Time constraints meant only one mix speed was trialled for neutralisation – 350 rpm, to compare with PFL previous testing
5. Trial different times of mixing – including longer times
We only had time to trial one slaking mixing time of 60 minutes and one set of mixing times for the Treatment process, which were as per previous testing.
6. Compare types of MgO that we have with the Verum reports
We used EMag45 and Farmguard (200 mesh). Verum Report May2024, 24-000768 Round Three used Farmguard 200mesh also. (Blulux MgO and Lee Processors MgO used by Verum

were not used in our testing.) Lee Processors MgO took longer to neutralise (Verum report 'BT Mining Neutralisation Agent Comparison V1') so wasn't considered.

7. MgO testing with coagulants/flocculants and see if we can improve supernatant quality, turbidity and metals
This was done with the same best doses of Metalsorb and Rheomax used in previous Manchester St testing
8. Trial dosing directly with powder rather than slurry
This was not trialled.
9. The neutralised solutions would then be trialled with coagulants/flocculants as before and at various final PH levels to see if improvements can be made with supernatant quality after the neutralisation has been optimised.
The same chemical dosing for coagulants and flocculant was used, but a higher pH was achieved in neutralisation than in previous testing.

1.2 Method

Two grades of Magnesium Oxide were considered for use and compared.

1. Farmguard, 200 mesh, 87% MgO
2. EMag45, >90% MgO

The slaking method of the MgO was considered as a process that could be improved as a mechanism for achieving more efficiency in neutralisation.

Slaking optimisation was considered to avoid "drowning" and "burning". Drowning is where excessive water, particularly when cold can hydrate the surface of the particles quickly, but the mass of hydrate formed impeded penetration of the water into the centre of the particle, delaying the rupture of the particle into microparticles, resulting in courser particles or incomplete hydration. This can result in a product that will settle out, causing plugging instead of behaving like a suspended slurry.

Burning is where insufficient water is added to the oxide, with the hydrate reaching excessive temperatures instead of the desired temperature of just below boiling. This also causes reduced hydration.

Method:

Slaking was performed using a Jar stirrer, so paste slaking was not possible.
A 10% slurry was made up with Deionised water of different temperatures in each jar.
Glass 500ml beakers were used for jar stirring, filling first with half of the deionised water, then MgO powder, then slaked on fast stir 350rpm until all the MgO powder was added.

Slurry was made up with the following Magnesium Oxide at the following Deionised water which was heated to initial temperatures 20°C, 35°C, 50°C and 65°C before slaking, to see the effect of heat on the slurry slaking effectiveness.

The Slurry was mixed for 60 mins at 350 rpm.

Water temperature dropped rapidly even though ambient temperature was 24°.

For both the Farmguard 200 mesh and the EMag45, the slurry temperature did not rise during slaking, it ended up at around 21, 28, 30 and 31°C respectively for both Farmguard and Emag45, indicating that for the 10 % slurry, efficient slaking did not occur. It is likely that the concentration of water was too high. A suspended slurry did not form, but it settled rapidly in the jars and after 2 minutes it had settled. It was transferred to amber glass bottles and after overnight (over 12 hours) the EMag45 slurry had cemented to the bottom of the bottle and would not move even when the bottle was inverted and shaken.

The Farmguard slurry was able to be resuspended with shaking of the bottle.

Figure 1 Slurry mixing EMag45 - adding MgO to heated Deionised Water at Rapid mix speed 350 RPM

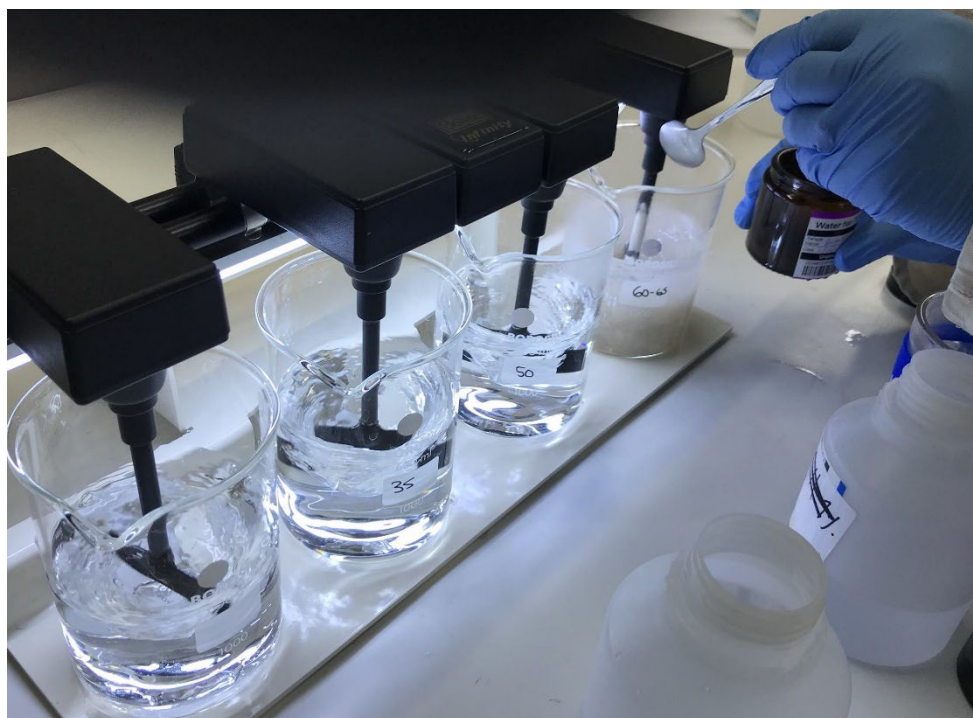
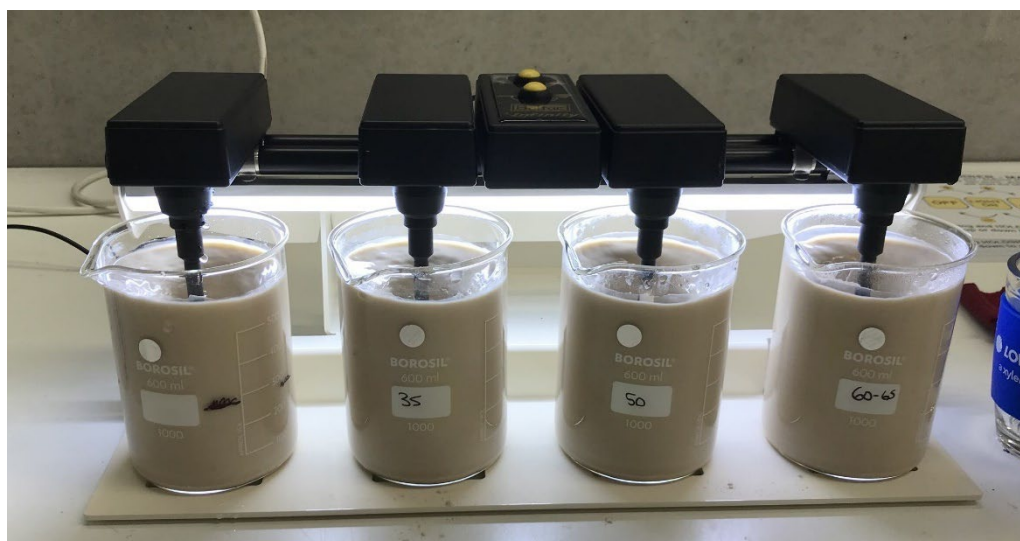


Figure 2 Farmguard Start of Slaking Process, makeup water at 20, 35, 50 and 65°C in jars left to right respectively.



Both Farmguard and Emag45 looked similar in the slurry mixing phase. Both slurries dropped in temperature from their initial temperature. Farmguard at 35°C and Emag45 at 20°C were the only samples that showed slight initial increases in temperature.

Figure 3 Farmguard Slurry Temperature during slaking of 60 minutes

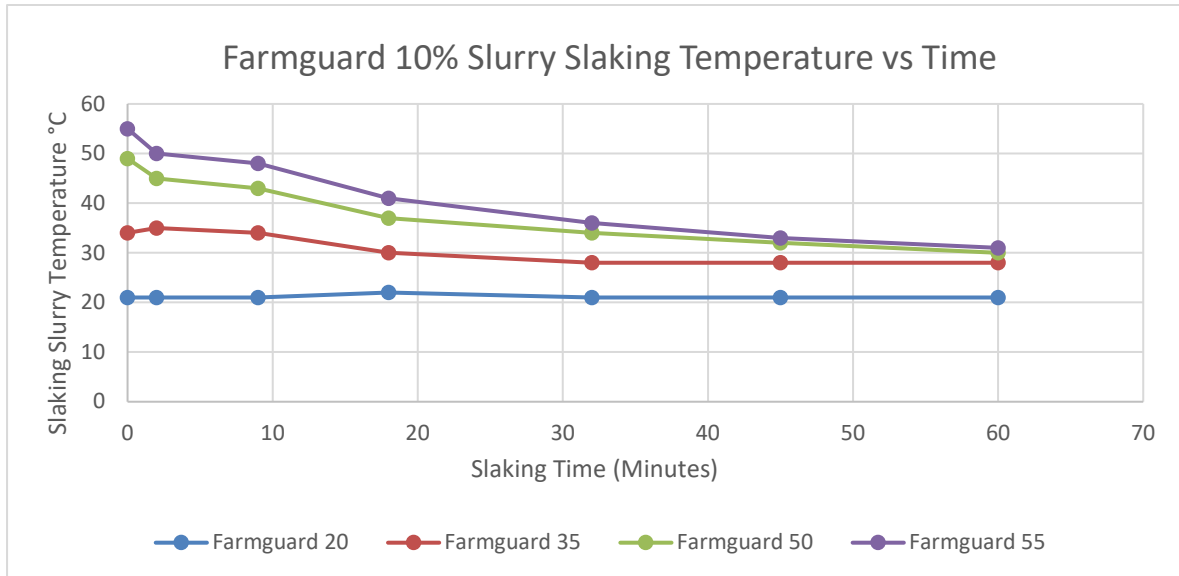


Figure 4 Emag45 Slurry Temperature during slaking of 60 minutes

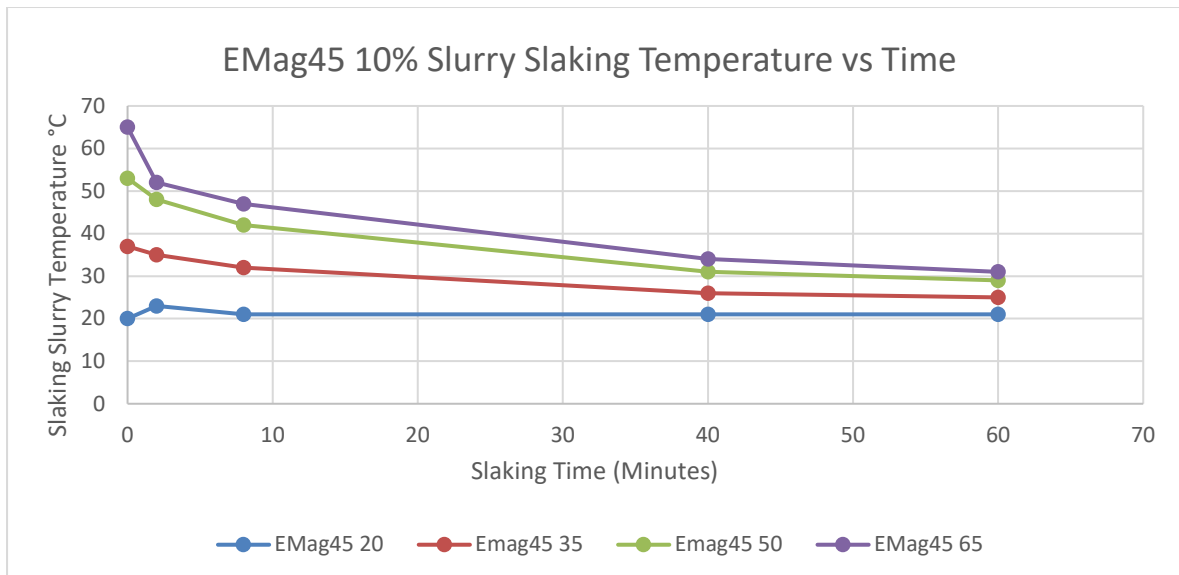


Figure 5 Farmguard 20°, 35°, 50° 65° slurries after slaking.



Figure 6 Farmguard Slurry 2 minutes after slaking finished, already settling out.



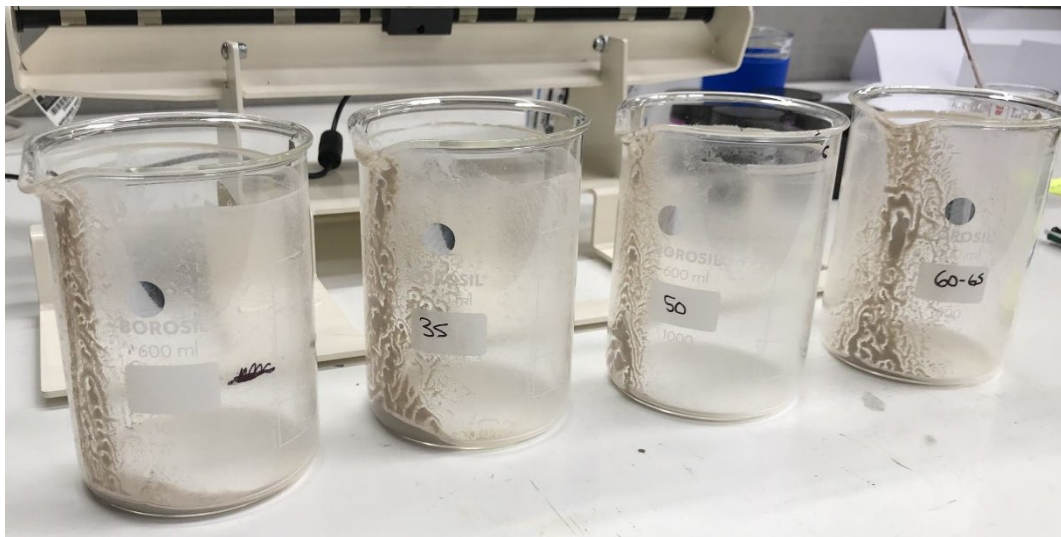
Figure 7 Emag45 slurry 2 minutes after slaking, settling rapidly in jar - not suspended



Figure 8 Farmguard Slurry residue after removal from jars, 20°-65°C slaking temperatures left to right



Figure 9 EMag45 residue after slurry removed from jars



Although slurry formation had not efficiently occurred, the slurries were used for neutralisation and neutralisation/coagulation/flocculation testing to determine any difference in treatment results with the slaked slurries.

Four slurries were used for the testing. These were the slurries Farmguard 20°C, Farmguard 55°C, EMag45 20 °C and EMag45 65°C. Two tests were carried out including:

Test 1: Neutralisation test and

Test 2: Neutralisation/Coagulation/Flocculation and Settling test

Neutralisation, coagulation, flocculation and settling, showed little settling in the 30-minute window. However, after 24 hours most had settled.

1.2.1 Neutralisation results

Neutralisation of Manchester st water was trialled with MgO slurries at different temperatures to observe change in pH. Figure 10 shows Farmguard with a 9ml/L dose and Figure 11 shows Farmguard with a 8ml/L dose.

Figure 10 Magnesium Neutralisation of AMD - pH change with time 900g/m3 dose

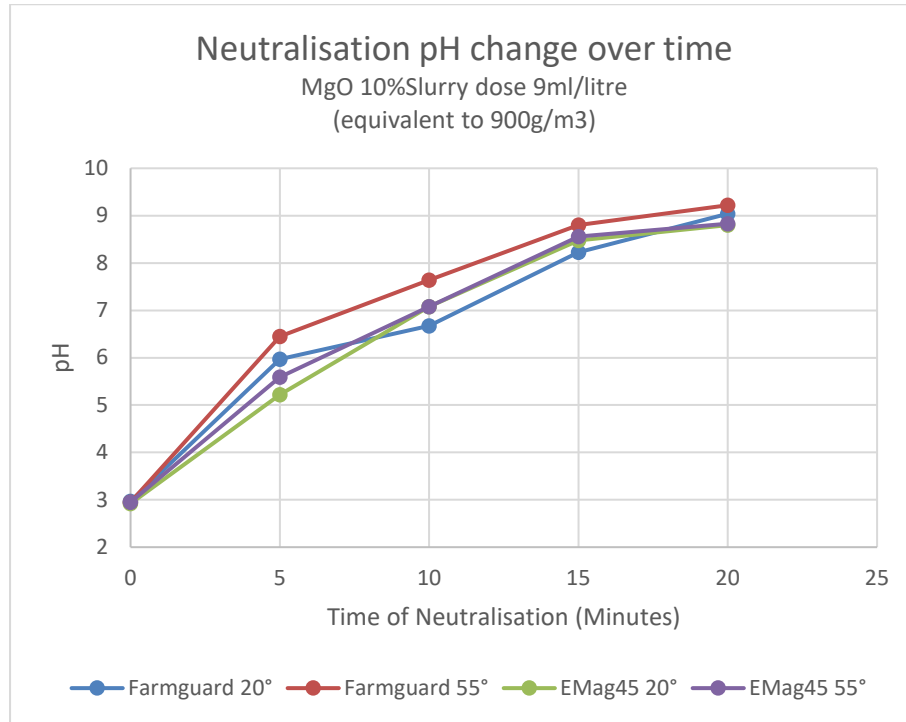
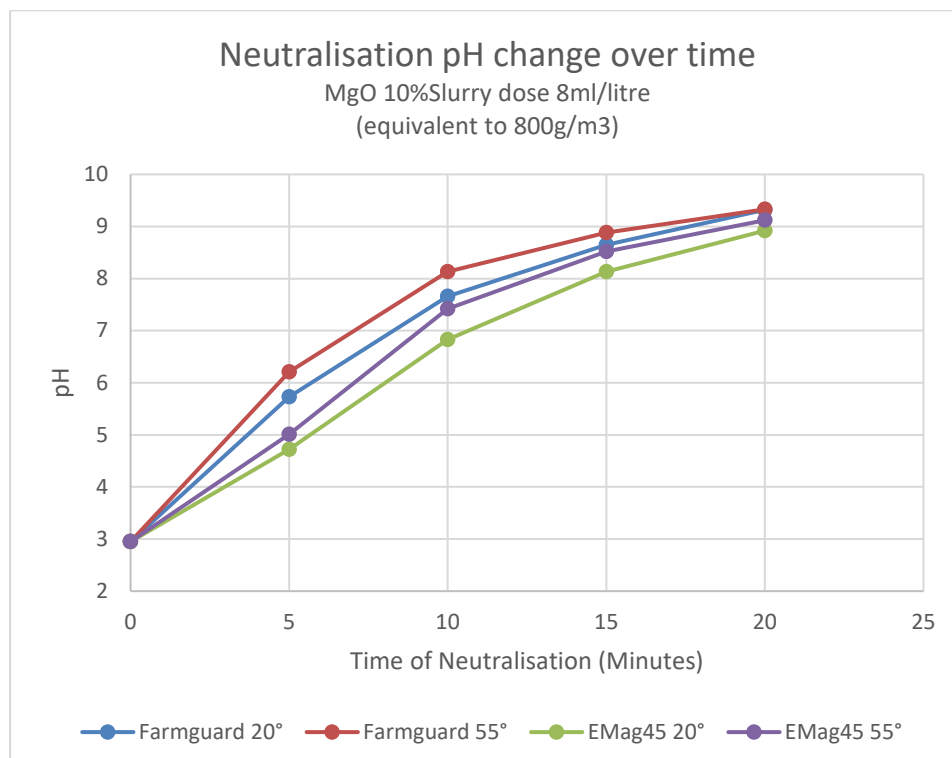


Figure 11 Magnesium Neutralisation of AMD - pH change with time 800g/m3 dose



Neutralisation was slightly quicker with Farmguard slaked at 55° than the other slurries (Farmguard 20°, EMag45 20° and 55°), however after 20 minutes there was little difference between them in terms of final pH achieved. More work is needed to optimise slaking of the slurry, this may improve neutralisation further.

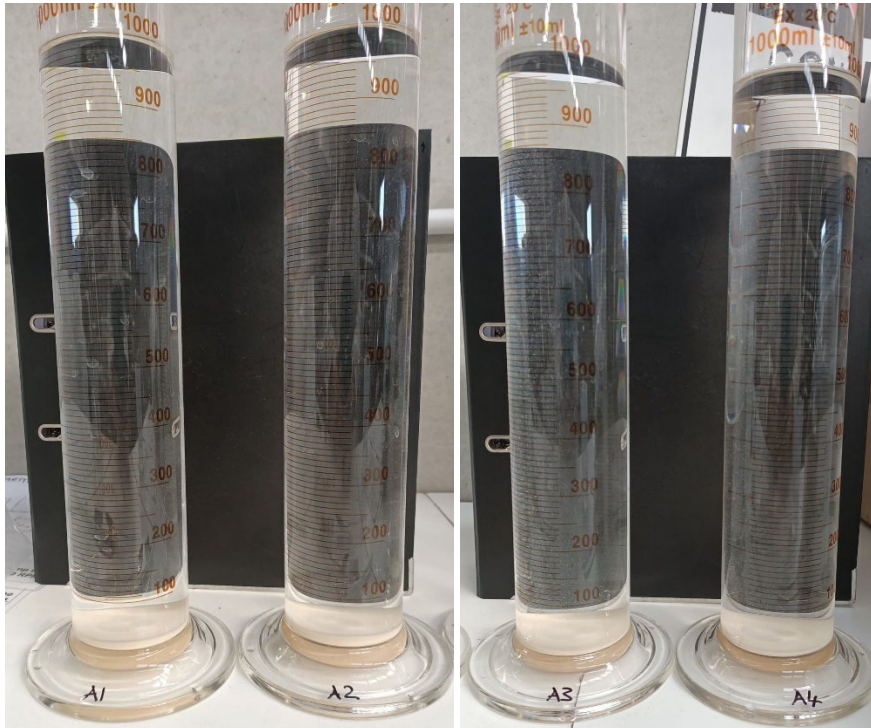
1.2.2 Settling Results

The samples were cloudy after 30 minutes settling (see Figure 12), this was similar to that which had been seen in previous bench testing (from report **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0**). After 24 hours settling had occurred (see Figure 13), although particles could still be seen floating in the supernatant. This is indicating that if scaled to a functioning WTP process, MgO would not be able to be used in a settling device with only 30 minutes settling time.

Figure 12 Neutralisation, Coagulation, Flocculation and 30 minutes Settling - samples Farm 20°C, Farm 55°C, Emag20°C and Emag 65°C left to right.



Figure 13 Neutralisation, Coagulation, Flocculation and 24 hours Settling - samples Farm 20°C, Farm 55°C, Emag20°C and Emag 65°C left to right.



1.2.3 Conclusions

Neutralisation was slightly quicker with Farmguard slaked at 55° than the other slurries (Farmguard 20°, EMag45 20° and 55°), however after 20 minutes there was little difference between them in terms of final pH achieved. More work is needed to optimise slaking of the slurry, this may improve neutralisation further.

The MgO testing results with 24 hour settling showed some compliance with metals GV's, with three of the MgO tests that fully complied with all metals GV's but did not comply with pH and Turbidity treated targets. One set of results did not comply with Nickel 95% LoP and pH and Turbidity treated targets were not met.

Settling did not occur within 30 minutes, so this would not be suitable for achieving WTP lamella settling and it is likely that most of the settling would occur in a polishing pond beyond the WTP. The handling of the slurry, including optimising the slaking and slurry makeup concentration would need to be improved to make this a viable process, as the quick settling and clogging characteristic of this material at 10% slurry, would make a slurry of this concentration a potential operational maintenance issue.

1.3 MgO Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 1 shows neutralisation test parameters and dosing of reagents, Table 2 presents the supernatant results of these tests to compare supernatant quality.

Table 1 MgO Test 2 - 13/12/25 Process Parameters for Neutralisation, Coagulation, Flocculation and 24 hours Settling

PF Test Number Identifier and Date Sample Sent for Analysis		MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Hills Lab Number:		3841393.1	3841393.2	3841393.3	3841393.4
Sample		Manchester St	Manchester St	Manchester St	Manchester St
Neutralent		Farmguard MgO 10% Slurry Slaked at 20°C	Farmguard MgO 10% Slurry Slaked at 55°C	EMAG45 MgO 10% Slurry Slaked at 20°C	EMAG MgO 10% Slurry Slaked at 65°C
Coagulant		Metalsorb	Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax 1050	Rheomax 1050	Rheomax 1050	Rheomax 1050
Sediment added		None	None	None	None
Rapid Mix time (Neutralisation)	minutes	30	30	30	30
Rapid Mix time for coagulant addition	minutes	1	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1	1
Slow Mix Time	minutes	10	10	10	10
Settling Time	minutes	24 hours	24 hours	24 hours	24 hours
Test Vessel Size		1 litre	1 litre	1 litre	1 litre

Table 2 Supernatant Water Quality from MgO Test 2 - 13/12/24 Neutralisation, Coagulation, Flocculation and 24 hours Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	MgO Test 2 Farm 20 13-Dec- 2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
In house PF testing - pH at end of Rapid Mix			9.4	9.39	9.18	9.27
Turbidity	NTU	19.8	33	38	6.6	12.3
Turbidity Target	NTU		5	5	5	5
pH	pH Units	3.2	8.9	9.4	8.4	8.8
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	<1	24	24	13	16
Total Hardness	g/m3 as CaCO3	270	650	660	650	650
Electrical Conductivity (EC)	mS/m	114.4				
Total Suspended Solids	g/m3	<70	-	-	-	-
TSS Target	g/m3		5	5	5	5
Dissolved Aluminium	g/m3	51	0.075	0.091	0.034	0.03
Dissolved Aluminium Chronic GV 95%	g/m3		0.50	0.44	0.34	0.47
Dissolved Aluminium Chronic GV 90%	g/m3		0.63	0.55	0.43	0.59
Dissolved Aluminium Chronic GV 80%	g/m3		0.86	0.75	0.59	0.81
Dissolved Cadmium	g/m3	0.00081	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	69	72	74	71	70
Dissolved Chromium	g/m3	0.0051	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m3	0.094	0.0013	0.0009	0.0168	0.0075
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0013	0.0011	0.0009	0.0012
Dissolved Copper Chronic GV 90%	g/m3		0.0015	0.0013	0.0011	0.0014
Dissolved Copper Chronic GV 80%	g/m3		0.0024	0.0021	0.0018	0.0023
Dissolved Iron	g/m3	13.2	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1
Dissolved Lead	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	24	115	115	114	115
Dissolved Manganese	g/m3	1.99	0.09	0.036	1.13	0.65
Dissolved Manganese Chronic GV 95%	g/m3		1.24	1.25	1.24	1.24
Dissolved Manganese Chronic GV 90%	g/m3		1.90	1.92	1.90	1.90
Dissolved Manganese Chronic GV 80%	g/m3		3.11	3.13	3.11	3.11
Dissolved Nickel	g/m3	0.23	0.0188	0.0152	0.1	0.066
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	1.11	< 0.0010	0.0012	0.0033	0.0023
Dissolved Zinc Chronic GV 95%	g/m3		0.042	0.039	0.035	0.040
Dissolved Zinc Chronic GV 90%	g/m3		0.062	0.058	0.052	0.060
Dissolved Zinc Chronic GV 80%	g/m3		0.107	0.099	0.090	0.103
Dissolved Organic Carbon (DOC)	g/m3		1.1	0.9	0.7	1
Absorbance at 254 nm	AU cm-1	0.518	0.008	0.007	0.005	0.008
Transmittance at 254 nm	%T, 1 cm cell	30.3	98.1	98.4	98.8	98.3
Iron + Manganese		15.19	0.11	0.056	1.15	0.67

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St Raw Water Sample	MgO Test 2 Farm 20 13-Dec- 2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.24	2.25	2.24	2.24

APPENDIX A –WATER QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3841393-SP-2-1

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

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Sample Type: Aqueous

Sample Name:		MgO Test 2 Farm 20 13-Dec-2024 3:20 pm	MgO Test 2 Farm 55 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 20 13-Dec-2024 3:20 pm	MgO Test 2 Emag45 65 13-Dec-2024 3:20 pm
Lab Number:		3841393.1	3841393.2	3841393.3	3841393.4
Turbidity	NTU	33	38	6.6	12.3
pH	pH Units	8.9	9.4	8.4	8.8
Total Alkalinity	g/m ³ as CaCO ₃	24	24	13.0	16.0
Total Hardness	g/m ³ as CaCO ₃	650	660	650	650
Dissolved Aluminium	g/m ³	0.075	0.091	0.034	0.030
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	72	74	71	70
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0013	0.0009	0.0168	0.0075
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	115	115	114	115
Dissolved Manganese	g/m ³	0.090	0.036	1.13	0.65
Dissolved Nickel	g/m ³	0.0188	0.0152	0.100	0.066
Dissolved Zinc	g/m ³	< 0.0010	0.0012	0.0033	0.0023
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.9	0.7	1.0
Absorbance at 254 nm	AU cm ⁻¹	0.008	0.007	0.005	0.008
Transmittance at 254 nm*	%T, 1 cm cell	98.1	98.4	98.8	98.3

Analyst's Comments**Sample 2 Comment:**

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

This certificate of analysis contains information extracted from 3841393-SPv2 issued on 09-Apr-2025 at 4:01 pm.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-4
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-4



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Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-4
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-4
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-4
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-4
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-4
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-4
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-4
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-4
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-4
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-4
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-4
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-4
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-4
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-4

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

Testing was completed between 02-Apr-2025 and 09-Apr-2025. 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.

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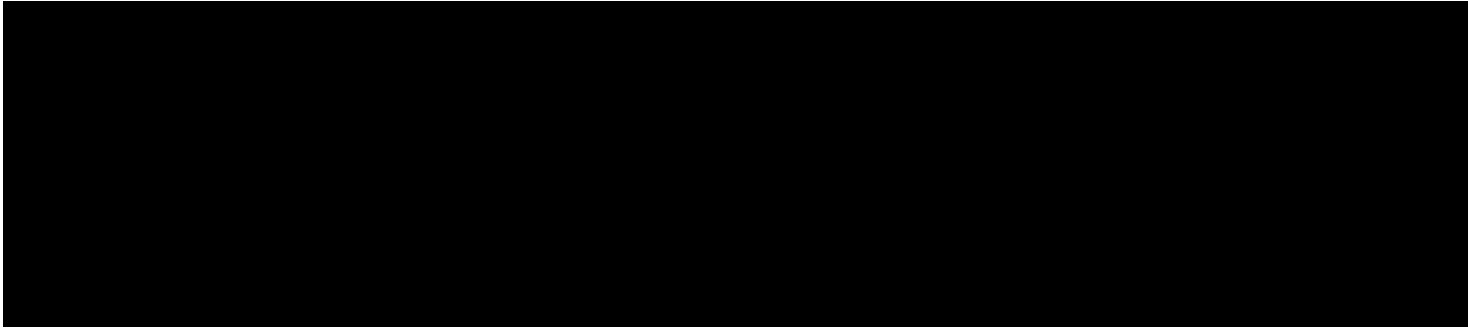


APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-24-NW-046418-01	REPORT DATE	05/08/2024
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Contact for your orders:		Order code:	EUNZWE-00196988
Contract:	Contract for Graymont (NZ) Limited		
Submission Reference:	Mak Oxd	Purchase Order Number:	1017166
SAMPLE CODE	812-2024-00109651		
Sample Name	Makareao Oxide 13-17/7		
Sample Reference	Makareao Oxide		
Reception Date & Time:	02/08/2024 9:30		
Analysis Started on:	03/08/2024	Analysis Ending Date:	05/08/2024
Product Type	Quicklime	Sampled Date & Time	30/07/2024 00:00
Sampler(s)	CUSTOMER		

RESULTS			LOQ
NW499	Arsenic - Total		
	Arsenic (As)	0.34	mg/kg
			0.05
NW504	Cadmium - Total		
	Cadmium (Cd)	0.64	mg/kg
			0.01
NW507	Chromium - Total		
	Chromium (Cr)	8.8	mg/kg
			0.2
NW509	Copper - Total		
	Copper (Cu)	1.3	mg/kg
			0.3
NW511	Lead - Total		
	Lead (Pb)	0.5	mg/kg
			0.1
NW515	Mercury - Total		
	Mercury (Hg)	<0.1	mg/kg
			0.1
NW517	Nickel - Total		
	Nickel (Ni)	1.2	mg/kg
			0.2

LIST OF METHODS			
NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature



& Water Testing



EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received.

Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT

SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15

New Zealand Supplier:
 Address:

Telephone:

Emergency No:
Website:

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

Disclaimer

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use

Supplier:
NZBN:
Street Address:

Telephone Number:
Facsimile:
Emergency Telephone:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/7

BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

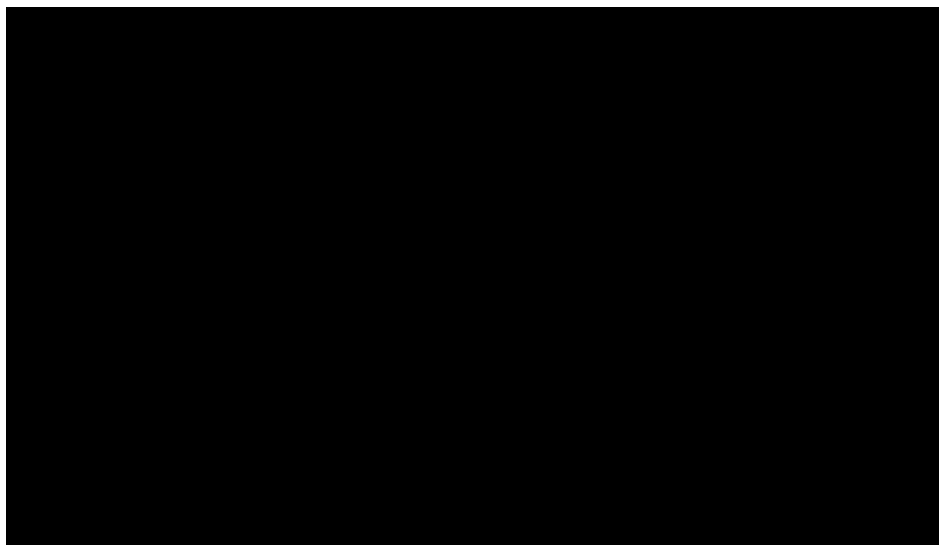
(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier



2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

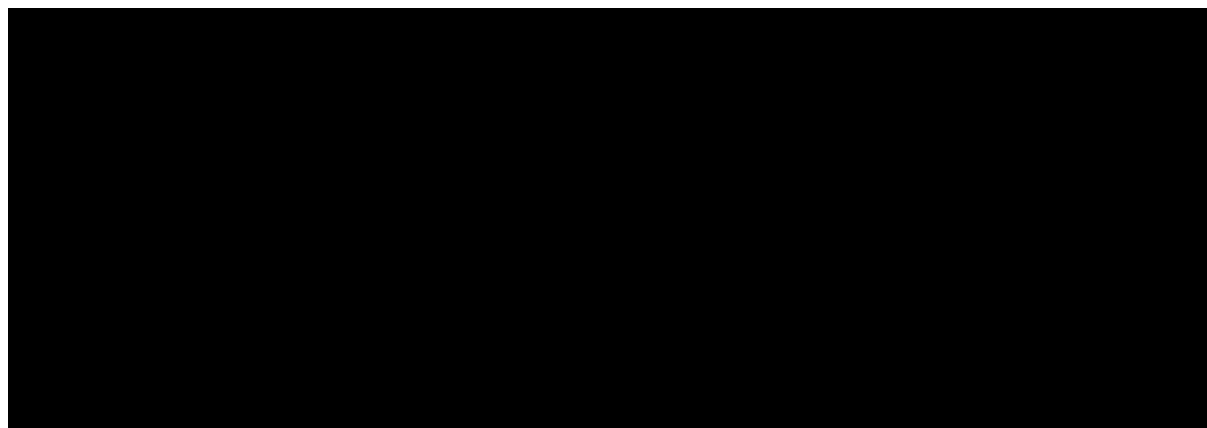
Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet



2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Melting point:	The substance / product decomposes therefore not determined.
Flash point:	not applicable
Solubility in water:	Forms a viscous solution.
Fire promoting properties:	not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:	No corrosive effect on metal.	
Formation of flammable gases:	Start temperature:	220 °C

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).
Acute toxicity: Oral LD50 (rat): >5000 mg/kg Dermal LD50 (rat): >5000 mg/kg	
Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).
Chronic effects:	
Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet

Supplier

Ixom Operations Pty Ltd (Incorporated in Australia)
NZBN: 9429041465226 Address: 166 Totara Street
Mt Maunganui South
New Zealand

Telephone Number: +64 9 368 2700

Facimile: +64 9 368 2710

For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: SUPERFLOC B SERIES

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

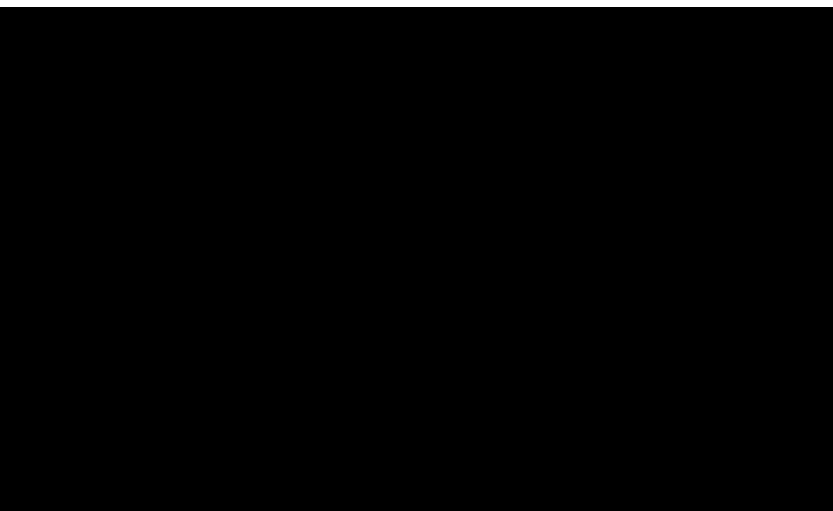
Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet



Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix H – WTP Bypass Water Testing

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRJ-RPT-00009

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated following client comments			G Smith	26/03/2026

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1.2	Results	4
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	Appendix B – CHEMICAL AND NEUTRALISING AGENT DATA	15

1 BYPASS WATER TESTING

This testing was carried out to simulate neutralisation only of WTP bypass water. This is a scenario that could occur during a storm event that exceeds the maximum design storm, resulting in raw AMD inflow exceeding the WTP Treatment capacity and AMD needing to bypass the Water Treatment Plant.

The simulation assumed that there would be neutralisation only using CaO with rapid mixing and a 30-minute settling time (in a basin at the mine), but no flocculation, or coagulation chemical added or process settling in the WTP.

Two water qualities were tested, Barren Valley ELF samples July 2024 (best quality AMD) and Manchester St (sampled July 2024) waters (Mean quality AMD). No sediment was added to these water samples for testing.

1.1 Method

- Prior to testing, clean equipment using Pyroneg and triple rinse with Deionised water followed by sample rinse
- Take 1L of Barren Valley ELF AMD and add CaO 20% slurry to reach process target pHs of:
 - 5.5, 6.0, 6.5, 7.0, 7.5.
- Rapid mix 20mins using Boltac Infinity Jar Stirrer @350RPM
- Settle 30mins in glass cylinder
- Decant supernatant for Hills analysis

Note: To achieve sufficient volume for analysis, two 1L jars of sample were prepared and these were combined at the end of the rapid mix then separated into two cylinders for the settling phase

1.2 Results

Barren Valley ELF results (Table 2) showed for the sample with the highest pH (7.4), metals were reduced below the modified Guideline Values except for Cobalt and Zinc. At lower pHs (5.5-7.0) Cadmium, Cobalt, Copper, Nickel and Zinc were above the modified Guideline Values. For the lowest pH (5.9) Copper was above the modified Guideline Value. The results for the Iron Plus Manganese were less than the modified Guideline Value at all pHs.

For all pHs, Aluminium was reduced to below the modified Guideline Values. Suspended solids exceeded the target level in all tests.

In the Manchester St results (Table 3), lower to mid pH values around 5.5-7.0 (in the PFL testing) yielded results where Cadmium, Cobalt, Nickel and Manganese, were above the modified Guideline Values.

With the higher pH value of 7.5, only Cobalt were above the modified Guideline Values. The results for the Iron Plus Manganese were less than the modified Guideline Value at all pHs. At the lowest pH (5.5) copper also exceeded the Guideline Values at the 95% LOP and Zinc at all LOPs.

At all pHs Manganese exceeded the modified Guideline Value at the 95% LOP but did not exceed the 90% & 80% LoPS.

For all pHs, Aluminium was reduced to below the modified Guideline Values. Suspended solids exceeded the target level in all tests.

The AMD WTP treatment (Neutralisation and Coagulation/Flocculation/Settling) processes tested for previously and in this report have produced supernatant of a higher quality than these Bypass testing results. This is evident when comparing the Bypass results with typical compliance of the Tests T14S2 (Aug 24) Manchester St WTP testing result from previous AMD Treatment testing (included in the

tables below for Manchester St), and Test T15S2-ELF (Aug 24) is representative of the Barren Valley ELF WTP treated results.

Aluminium is above the Guideline Values in the comparison tests result T14S2 and T15S2-ELF and further treatment processes trialled as outlined in Appendix M shows that Aluminium can be removed to below the Guideline Values.

Our assessment of the results is that this process of neutralisation only for treating the Bypass has limited use and therefore is not recommended as an effective means of reaching treated water that complies with the modified Guideline Values. If this process was required to be investigated further, we suggest investigating a two-stage pH process, with a settling basin after each stage, to remove metals that respond to high and low pH sequentially.

Please note that Acute Modified Guideline Values have not been used here, as it is possible that a treatment process bypass, if used, may occur over several days in a rain event. We currently have had no guidance about when an acute limit would cease to apply and when event length requires comparison with a chronic limit, hence we have used the chronic guideline values here. We do not see that a neutralisation only bypass treatment process would be suitable to meet the Chronic Modified Guideline Values.

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 1 Bypass Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling - BVE

PF Test Number Identifier and Date Sample Sent for Analysis		BVELF Bypass T1 J1J2 7.5 17-Mar- 2025 3:00 pm	BVELF Bypass T1 J3J4 7.0 17-Mar-2025 3:00 pm	BVELF Bypass T3 J1J2 6.5 19-Mar-2025 12:00 pm	BVELF Bypass T3 J3J4 6.0 19-Mar-2025 12:00 pm	BVELF Bypass T2 J1J4 5.5 17-Mar-2025 4:00 pm	For Comparison T15S2-ELF 27-Aug-2024 12:00 pm
Hills Lab Number:		3841393.5	3841393.6	3841393.7	3841393.8	3841393.9	3668046.5
Sample		BVE Influent Sample (prior to MSR) 2024	BVE Influent Sample (prior to MSR) 2024	BVE Influent Sample (prior to MSR) 2024	BVE Influent Sample (prior to MSR) 2024	BVE Influent Sample (prior to MSR) 2024	BVE Influent Sample (prior to MSR) 2024
Neutralent		CaO 20% slurry	CaO 20% slurry	CaO 20% slurry	CaO 20% slurry	CaO 20% slurry	CaO 20% slurry
Dose		0.3mL=0.06mg/L	0.32mL=0.064mg/L	0.3mL=0.06mg/L	0.31mL=0.062mg/L	0.25mL=0.05mg/L	0.4mL = 0.08 mg/l
Coagulant		None	None	None	None	None	Metalsorb
Flocculant		None	None	None	None	None	Rheomax
Sediment added		None	None	None	None	None	3g/l
Rapid Mix time (Neutralisation)	minutes	50 min	50 min	50 min	50 min	30 min	20
Rapid Mix time for coagulant addition		None	None	None	None	None	1
Rapid Mix time for coagulant addition		None	None	None	None	None	1
Slow Mix Time	minutes	None	None	None	None	None	10
Settling Time		30 min	30 min	30 min	30 min	30 min	30 minutes
Test Vessel Size		1 litre	1 litre	1 litre	1 litre	1 litre	Bench Jar 1 Litre
Inhouse PF Testing – pH at end of Rapid Mix (range of two jars that were combined for the sample)		7.41-7.52	6.82-6.95	6.35-6.43	6.06-6.16	5.33-5.39	

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 2 Supernatant Water Quality Results – Bypass Testing – BVE

PF Test Identifier and Date Sent for Analysis		Barren Valley Elf Raw Water Sample	BVELF Bypass T1 J1J2 7.5 17-Mar-2025	BVELF Bypass T1 J3J4 7.0 17-Mar-2025	BVELF Bypass T3 J1J2 6.5 19-Mar-2025	BVELF Bypass T3 J3J4 6.0 19-Mar-2025	BVELF Bypass T2 J1J4 5.5 17-Mar-2025	T15S2-ELF 27-Aug-2024
Turbidity	NTU	1.69	3.6	4.5	3.8	5.8	2.9	1.44
Turbidity Target	NTU		5	5	5	5	5	5
pH	pH Units	3.4	7.4	6.5	6.6	6.4	5.9	7.6
pH Target	pH Units		4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Alkalinity ##	g/m3	< 1.0	14.6	7.5	9.3	7.4	4	21
Hardness ##	g/m3	90	200	193	194	196	186	200
EC*	mS/m	47.6						
TSS***	g/m3	< 8	33	37	38	39	35	3
TSS Target	g/m3		5	5	5	5	5	5
Aluminium #	g/m3	10	0.114	0.025	0.023	0.018	0.097	0.49
Aluminium Chronic GV 95%	g/m3		0.21	0.16	0.16	0.5	0.5	0.34
Aluminium Chronic GV 90%	g/m3		0.27	0.20	0.20	0.5	0.5	0.43
Aluminium Chronic GV 80%	g/m3		0.36	0.28	0.27	0.5	0.5	0.59
Cadmium #	g/m3	0.00034	0.00011	0.00029	0.0003	0.00032	0.00035	< 0.00005
Cadmium Chronic GV 95%	g/m3		0.00028	0.00027	0.00027	0.00028	0.00027	0.00028
Cadmium Chronic GV 90%	g/m3		0.00052	0.00050	0.00051	0.00051	0.00049	0.00052
Cadmium Chronic GV 80%	g/m3		0.00117	0.00114	0.00114	0.00115	0.00110	0.00117
Calcium #	g/m3	31	75	71	72	72	69	76
Chromium #	g/m3	0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cobalt #	g/m3	0.048	0.024	0.044	0.044	0.046	0.047	0.0057
Cobalt Chronic GV 95%	g/m3		0.0025	0.0024	0.0024	0.0025	0.0024	0.0025
Cobalt Chronic GV 90%	g/m3		0.0059	0.0058	0.0058	0.0058	0.0057	0.0059
Cobalt Chronic GV 80%	g/m3		0.0157	0.0154	0.0155	0.0155	0.0152	0.0157

PF Test Identifier and Date Sent for Analysis		Barren Valley Elf Raw Water Sample	BVELF Bypass T1 J1J2 7.5 17-Mar-2025	BVELF Bypass T1 J3J4 7.0 17-Mar-2025	BVELF Bypass T3 J1J2 6.5 19-Mar-2025	BVELF Bypass T3 J3J4 6.0 19-Mar-2025	BVELF Bypass T2 J1J4 5.5 17-Mar-2025	T15S2-ELF 27-Aug-2024
Copper #	g/m3	0.0161	< 0.0005	0.0009	0.0006	0.0008	0.005	< 0.0005
Copper Chronic GV 95%	g/m3		0.0008	0.0010	0.0009	0.0011	0.0011	0.0013
Copper Chronic GV 90%	g/m3		0.0010	0.0012	0.0011	0.0013	0.0013	0.0015
Copper Chronic GV 80%	g/m3		0.0016	0.0019	0.0018	0.0021	0.0021	0.0024
Iron #	g/m3	7.1	0.02	0.02	0.02	0.02	0.02	< 0.02
Iron Chronic GV 80%/90%/95%	g/m3		1	1	1	1	1	1
Lead #	g/m3	0.0057	< 0.00010	0.00014	< 0.00010	0.00019	0.00185	< 0.00010
Magnesium #	g/m3	3.2	3.5	3.6	3.6	3.7	3.6	3.4
Manganese #	g/m3	0.47	0.37	0.45	0.44	0.45	0.45	0.24
Manganese Chronic GV 95%	g/m3		0.76	0.75	0.75	0.76	0.74	0.76
Manganese Chronic GV 90%	g/m3		1.17	1.16	1.16	1.16	1.14	1.17
Manganese Chronic GV 80%	g/m3		1.92	1.89	1.89	1.90	1.86	1.92
Nickel #	g/m3	0.096	0.048	0.094	0.093	0.099	0.1	0.022
Nickel Chronic GV 95%	g/m3		0.055	0.054	0.054	0.054	0.052	0.055
Nickel Chronic GV 90%	g/m3		0.065	0.063	0.064	0.064	0.061	0.065
Nickel Chronic GV 80%	g/m3		0.085	0.083	0.083	0.084	0.080	0.085
Zinc #	g/m3	0.6	0.033	0.31	0.24	0.35	0.5	0.0015
Zinc Chronic GV 95%	g/m3		0.030	0.068	0.060	0.079	0.113	0.033
Zinc Chronic GV 90%	g/m3		0.045	0.102	0.089	0.117	0.168	0.049
Zinc Chronic GV 80%	g/m3		0.077	0.175	0.154	0.202	0.289	0.084
DOC	g/m3		0.6	0.8	0.7	0.9	0.9	1.1
Absorbance at 254 nm	AU cm-1	0.191	0.036	0.006	0.018	0.019	0.023	0.011
Transmittance at 254 nm	%T, 1 cm cell	64.4	92.1	98.7	95.9	95.7	94.8	97.6
Iron + Mn #		7.57	0.39	0.47	0.46	0.47	0.47	0.26
Iron + Mn Chronic GV 80%/90%/95%	g/m3		1.76	1.75	1.75	1.76	1.74	1.76
Sulphate	g/m3	186						

PF Test Identifier and Date Sent for Analysis		Barren Valley Elf Raw Water Sample	BVELF Bypass T1 J1J2 7.5 17-Mar-2025	BVELF Bypass T1 J3J4 7.0 17-Mar-2025	BVELF Bypass T3 J1J2 6.5 19-Mar-2025	BVELF Bypass T3 J3J4 6.0 19-Mar-2025	BVELF Bypass T2 J1J4 5.5 17-Mar-2025	T15S2-ELF 27-Aug-2024
Sodium #	g/m3	2.4						
Total Acidity (pH 8.3)	g/m3 CaCO3	158						

Dissolved Metals

*DOC – Dissolved Organic Carbon

**EC Electrical Conductivity

##Total, as CaCO3 ***TSS

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 3 Bypass Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling - Manchester

PF Test Number Identifier and Date Sample Sent for Analysis		MAN Bypass T5 J1J2 7.5 19-Mar- 2025 2:45 pm	MAN Bypass T6 J3J4 7.0 19-Mar-2025 3:45 pm	MAN Bypass T6 J1J2 6.5 19-Mar-2025 3:45 pm	MAN Bypass T4 J3J4 6.0 19-Mar-2025 1:30 pm	MAN Bypass T4 J1J2 5.5 19-Mar-2025 1:30 pm	For Comparison T14S2-MAN 26-Aug- 2024 4:00 pm
Hills Lab Number:		3841393.1	3841393.11	3841393.12	3841393.13	3841393.14	3668046.3
Sample							Manchester st
Neutralent		CaO 20% slurry	CaO 20% slurry	CaO 20% slurry	CaO 20% slurry	CaO 20% slurry	CaO
Dose		1.1mL=0.22mg/L	1.07mL=0.214 mg/L	1.055mL=0.211 mg/L	1.05mL=0.21 mg/L	1mL=0.2 mg/L	1.3mg/l
Coagulant		None	None	None	None	None	Metalsorb
Flocculant		None	None	None	None	None	Rheomax
Sediment added		None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	minutes	20 min	30 min	20 min	20 min	20 min	20
Rapid Mix time for coagulant addition		None	None	None	None	None	1
Rapid Mix time for coagulant addition		None	None	None	None	None	1
Slow Mix Time	minutes						10
Settling Time		30 min	30 min	30 min	30 min	30 min	30 minutes
Test Vessel Size		1 litre	1 litre	1 litre	1 litre	1 litre	Bench Jar 1 Litre
Inhouse PF Testing – pH at end of Rapid Mix (range of two jars that were combined for the sample)		7.75-7.77	6.87-6.87	6.59-6.63	6.03-6.05	5.75-5.84	

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 4 Supernatant Water Quality Results – Bypass Testing – Manchester

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	MAN Bypass T5 J1J2 7.5 19-Mar-2025	MAN Bypass T6 J3J4 7.0 19-Mar-2025	MAN Bypass T6 J1J2 6.5 19-Mar-2025	MAN Bypass T4 J3J4 6.0 19-Mar-2025	MAN Bypass T4 J1J2 5.5 19-Mar-2025	T14S2-MAN 26-Aug-2024
Turbidity	NTU	19.8	2.1	2.8	2.8	1.72	1.85	0.86
Turbidity Target	NTU		5	5	5	5	5	5
pH	pH	3.2	6.8	6.6	6.7	6.5	5.9	7.7
pH Target	pH		4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Alkalinity ##	g/m3	<1	12.5	10.1	11.8	7.3	4	14.7
Hardness ##	g/m3	270	650	630	650	640	620	630
EC*	mS/m	114.4						
TSS***	g/m3	<70	19	26	26	17	-	5
TSS Target	g/m3		5	5	5	5	5	5
Aluminium #	g/m3	51	0.062	0.035	0.046	0.024	0.151	0.93
Aluminium Chronic GV 95%	g/m3		0.18	0.17	0.17	0.16	0.5	0.48
Aluminium Chronic GV 90%	g/m3		0.23	0.21	0.22	0.21	0.5	0.61
Aluminium Chronic GV 80%	g/m3		0.31	0.29	0.30	0.28	0.5	0.83
Cadmium #	g/m3	0.00081	0.00017	0.00033	0.0002	0.00046	0.00072	< 0.00005
Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037	0.00037	0.00037
Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069	0.00069	0.00069
Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Calcium #	g/m3	69	220	210	220	220	210	220
Chromium #	g/m3	0.0051	0.0008	0.0007	0.0007	0.0008	< 0.0005	< 0.0005
Cobalt #	g/m3	0.094	0.024	0.045	0.028	0.059	0.08	0.0026
Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208	0.0208	0.0208

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	MAN Bypass T5 J1J2 7.5 19-Mar-2025	MAN Bypass T6 J3J4 7.0 19-Mar-2025	MAN Bypass T6 J1J2 6.5 19-Mar-2025	MAN Bypass T4 J3J4 6.0 19-Mar-2025	MAN Bypass T4 J1J2 5.5 19-Mar-2025	T14S2-MAN 26-Aug-2024
Copper #	g/m3	0.0133	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	< 0.0005
Copper Chronic GV 95%	g/m3		0.0007	0.0007	0.0007	0.0007	0.0008	0.0016
Copper Chronic GV 90%	g/m3		0.0009	0.0009	0.0009	0.0009	0.0010	0.0020
Copper Chronic GV 80%	g/m3		0.0014	0.0014	0.0014	0.0014	0.0016	0.0032
Iron #	g/m3	13.2	0.02	0.02	0.02	0.02	0.02	0.02
Iron Chronic GV 80%/90%/95%	g/m3		1.0	1.0	1.0	1.0	1.0	1.0
Lead #	g/m3	0.00136	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.00014	< 0.00010
Magnesium #	g/m3	24	23	23	23	24	25	22
Manganese #	g/m3	1.99	1.2	1.47	1.26	1.6	1.72	0.49
Manganese Chronic GV 95%	g/m3		1.24	1.22	1.24	1.23	1.22	1.22
Manganese Chronic GV 90%	g/m3		1.90	1.88	1.90	1.89	1.87	1.88
Manganese Chronic GV 80%	g/m3		3.11	3.07	3.11	3.09	3.05	3.07
Nickel #	g/m3	0.23	0.075	0.129	0.087	0.16	0.197	0.0115
Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099	0.099	0.099
Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118	0.118	0.118
Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154	0.154	0.154
Zinc #	g/m3	1.11	0.0157	0.059	0.027	0.105	0.58	< 0.0010
Zinc Chronic GV 95%	g/m3		0.088	0.104	0.096	0.113	0.197	0.067
Zinc Chronic GV 90%	g/m3		0.132	0.155	0.143	0.168	0.294	0.100
Zinc Chronic GV 80%	g/m3		0.226	0.266	0.245	0.289	0.506	0.172
DOC	g/m3		< 0.5	< 0.5	0.5	< 0.5	0.6	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.019	0.004	0.003	0.004	0.003	0.013
Transmittance at 254 nm	%T, 1 cm cell	30.3	95.7	99.1	99.2	99.1	99.2	97.1
Iron + Mn #		15.19	1.22	1.49	1.28	1.62	1.74	0.51
Iron + Mn Chronic GV 80%/90%/95%	g/m3		2.24	2.22	2.24	2.23	2.22	2.22

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	MAN Bypass T5 J1J2 7.5 19-Mar-2025	MAN Bypass T6 J3J4 7.0 19-Mar-2025	MAN Bypass T6 J1J2 6.5 19-Mar-2025	MAN Bypass T4 J3J4 6.0 19-Mar-2025	MAN Bypass T4 J1J2 5.5 19-Mar-2025	T14S2-MAN 26-Aug-2024
Sulphate	g/m3	690						
Sodium #	g/m3	4.2						
Total Acidity (pH 8.3)	g/m3 CaCO3	440						

Dissolved Metals

*DOC – Dissolved Organic Carbon

**EC Electrical Conductivity

##Total, as CaCO3 ***TSS

APPENDIX A –WATER AND SLUDGE QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3668046-SP-2

3841393-SP-2-2

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



Sample Type: Aqueous

Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Hardness	g/m ³ as CaCO ₃	640	2,300	630	2,200	200
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Hardness	g/m ³ as CaCO ₃	650	650	640	630	640
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24



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Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Hardness	g/m ³ as CaCO ₃	2,200	2,200	196	197	620
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Hardness	g/m ³ as CaCO ₃	630	2,100	2,200	210	210
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments

Sample 20 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces report '3668046-SPv1' issued on 17-Sep-2024 at 2:08 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Jun-2025. 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.

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Sample Type: Aqueous

Sample Name:		BVELF Bypass T1 J1J2 7.5 17-Mar-2025 3:00 pm	BVELF Bypass T1 J3J4 7.0 17-Mar-2025 3:00 pm	BVELF Bypass T3 J1J2 6.5 19-Mar-2025 12:00 pm	BVELF Bypass T3 J3J4 6.0 19-Mar-2025 12:00 pm	BVELF Bypass T2 J1J4 5.5 17-Mar-2025 4:00 pm
Lab Number:		3841393.5	3841393.6	3841393.7	3841393.8	3841393.9
Turbidity	NTU	3.6	4.5	3.8	5.8	2.9
pH	pH Units	7.4	6.5	6.6	6.4	5.9
Total Alkalinity	g/m ³ as CaCO ₃	14.6	7.5	9.3	7.4	4.0
Total Hardness	g/m ³ as CaCO ₃	200	193	194	196	186
Total Suspended Solids	g/m ³	33	37	38	39	35
Dissolved Aluminium	g/m ³	0.114	0.025	0.023	0.018	0.097
Dissolved Cadmium	g/m ³	0.00011	0.00029	0.00030	0.00032	0.00035
Dissolved Calcium	g/m ³	75	71	72	72	69
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.024	0.044	0.044	0.046	0.047
Dissolved Copper	g/m ³	< 0.0005	0.0009	0.0006	0.0008	0.0050
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	0.00014	< 0.00010	0.00019	0.00185
Dissolved Magnesium	g/m ³	3.5	3.6	3.6	3.7	3.6
Dissolved Manganese	g/m ³	0.37	0.45	0.44	0.45	0.45
Dissolved Nickel	g/m ³	0.048	0.094	0.093	0.099	0.100
Dissolved Zinc	g/m ³	0.033	0.31	0.24	0.35	0.50
Dissolved Organic Carbon (DOC)	g/m ³	0.6	0.8	0.7	0.9	0.9
Absorbance at 254 nm	AU cm ⁻¹	0.036	0.006	0.018	0.019	0.023
Transmittance at 254 nm*	%T, 1 cm cell	92.1	98.7	95.9	95.7	94.8

Sample Name:		MAN Bypass T5 J1J2 7.5 19-Mar-2025 2:45 pm	MAN Bypass T6 J3J4 7.0 19-Mar-2025 3:45 pm	MAN Bypass T6 J1J2 6.5 19-Mar-2025 3:45 pm	MAN Bypass T4 J3J4 6.0 19-Mar-2025 1:30 pm	MAN Bypass T4 J1J2 5.5 19-Mar-2025 1:30 pm
Lab Number:		3841393.10	3841393.11	3841393.12	3841393.13	3841393.14
Turbidity	NTU	2.1	2.8	2.8	1.72	1.85
pH	pH Units	6.8	6.6	6.7	6.5	5.9
Total Alkalinity	g/m ³ as CaCO ₃	12.5	10.1	11.8	7.3	4.0
Total Hardness	g/m ³ as CaCO ₃	650	630	650	640	620
Total Suspended Solids	g/m ³	19	26	26	17	-
Dissolved Aluminium	g/m ³	0.062	0.035	0.046	0.024	0.151
Dissolved Cadmium	g/m ³	0.00017	0.00033	0.00020	0.00046	0.00072
Dissolved Calcium	g/m ³	220	210	220	220	210
Dissolved Chromium	g/m ³	0.0008	0.0007	0.0007	0.0008	< 0.0005
Dissolved Cobalt	g/m ³	0.024	0.045	0.028	0.059	0.080
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0010
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.00014



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous						
Sample Name:		MAN Bypass T5 J1J2 7.5 19-Mar-2025 2:45 pm	MAN Bypass T6 J3J4 7.0 19-Mar-2025 3:45 pm	MAN Bypass T6 J1J2 6.5 19-Mar-2025 3:45 pm	MAN Bypass T4 J3J4 6.0 19-Mar-2025 1:30 pm	MAN Bypass T4 J1J2 5.5 19-Mar-2025 1:30 pm
Lab Number:		3841393.10	3841393.11	3841393.12	3841393.13	3841393.14
Dissolved Magnesium	g/m ³	23	23	23	24	25
Dissolved Manganese	g/m ³	1.20	1.47	1.26	1.60	1.72
Dissolved Nickel	g/m ³	0.075	0.129	0.087	0.160	0.197
Dissolved Zinc	g/m ³	0.0157	0.059	0.027	0.105	0.58
Dissolved Organic Carbon (DOC)	g/m ³	< 0.5	< 0.5	0.5	< 0.5	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.019	0.004	0.003	0.004	0.003
Transmittance at 254 nm*	%T, 1 cm cell	95.7	99.1	99.2	99.1	99.2

Analyst's Comments

This certificate of analysis contains information extracted from 3841393-SPv2 issued on 09-Apr-2025 at 4:01 pm.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	5-14
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	5-14
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	5-14
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	5-14
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	5-14
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	5-13
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	5-14
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	5-14
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	5-14
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	5-14
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	5-14
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	5-14
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	5-14
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	5-14
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	5-14
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	5-14
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	5-14
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	5-14

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	5-14
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	5-14
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	5-14
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	5-14

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

Testing was completed between 02-Apr-2025 and 08-Apr-2025. 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.

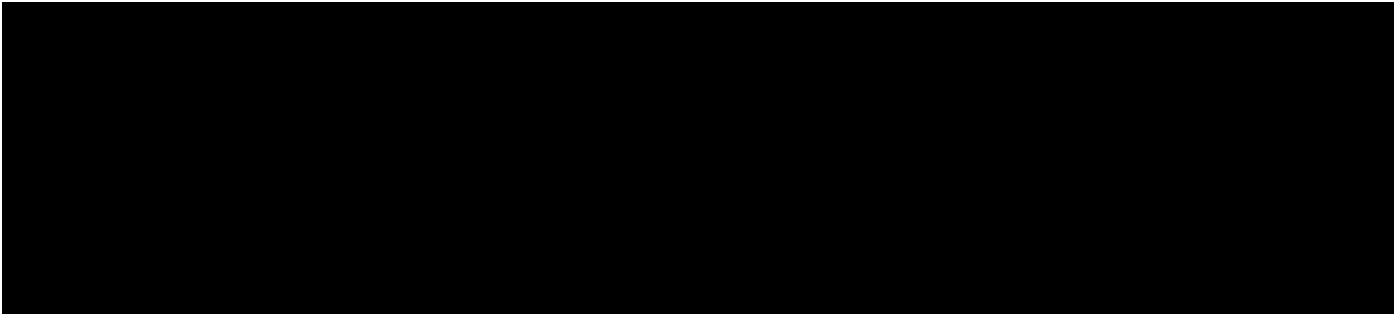
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APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing
ANALYTICAL REPORT

REPORT CODE	AR-24-NW-046418-01	REPORT DATE	05/08/2024
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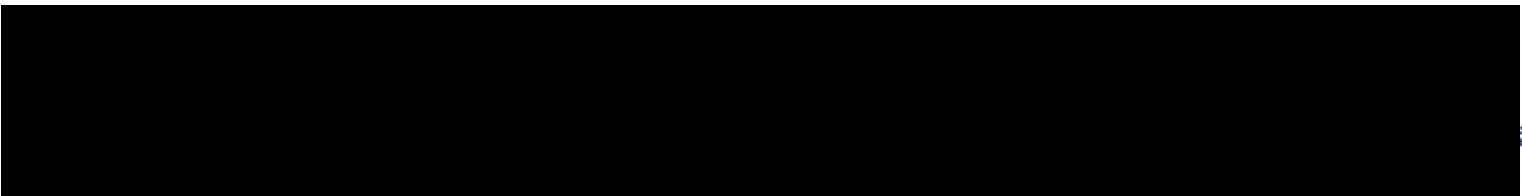


Contact for your orders:		Order code:	EUNZWE-00196988
Contract:	Contract for Graymont (NZ) Limited		
Submission Reference:	Mak Oxd	Purchase Order Number:	1017166
SAMPLE CODE812-2024-00109651			
Sample Name	Makareao Oxide 13-17/7		
Sample Reference	Makareao Oxide		
Reception Date & Time:	02/08/2024 9:30		
Analysis Started on:	03/08/2024	Analysis Ending Date:	05/08/2024
Product Type	Quicklime	Sampled Date & Time	30/07/2024 00:00
Sampler(s)	CUSTOMER		

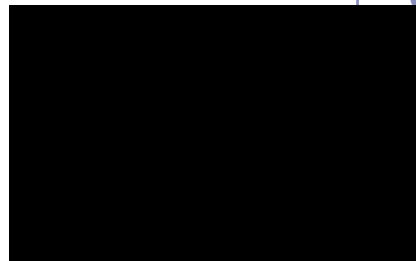
RESULTS			LOQ
NW499	Arsenic - Total		
	Arsenic (As)	0.34	mg/kg0.05
NW504	Cadmium - Total		
	Cadmium (Cd)	0.64	mg/kg0.01
NW507	Chromium - Total		
	Chromium (Cr)	8.8	mg/kg0.2
NW509	Copper - Total		
	Copper (Cu)	1.3	mg/kg0.3
NW511	Lead - Total		
	Lead (Pb)	0.5	mg/kg0.1
NW515	Mercury - Total		
	Mercury (Hg)	<0.1	mg/kg0.1
NW517	Nickel - Total		
	Nickel (Ni)	1.2	mg/kg0.2

LIST OF METHODS			
NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature



Food & Water Testing



EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received. Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

This document can only be reproduced in full.

The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT



SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
Restriction of Use in NZ: Refer to Section 15

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

Disclaimer

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

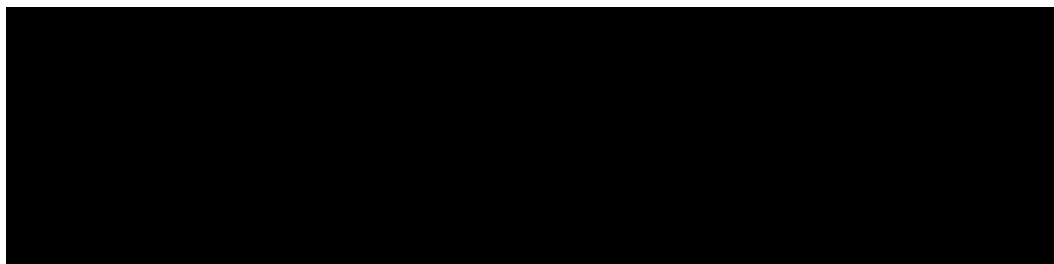
Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: MAGNESIUM OXIDE 87%

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

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Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

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Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

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Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

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Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/7

BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier

Company:

BASF Australia Limited (ABN 62 008 437 867)
Level 12, 28 Freshwater Place Southbank
Victoria 3006, AUSTRALIA
Telephone: +61 3 8855-6600
Telefax number: +61 3 8855-6511

Emergency information:

BASF Emergency Advice Number: 1800 803 440 (24h) [within Australia]
BASF Emergency Advice Number: + 61 3 8855 6666 [outside Australia]

NZ Supplier Contact Details

Chemiplas (NZ) Ltd
137 Great North Road
Grey Lynn Auckland 1021
Ph +64 9 361 4060 Fax +64 9 361 2244
24 HR Emergency Ph No.+64 9 3614061

2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation.

Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet

Company:

BASF SE
67056 Ludwigshafen
GERMANY

Contact address:

BASF plc
PO Box 4, Earl Road, Cheadle Hulme,
Cheadle, Cheshire
SK8 6QG, UNITED KINGDOM

Telephone: +44 161 485-6222

E-mail address: product-safety-north@basf.com

Emergency telephone number

International emergency number:

Telephone: +49 180 2273-112

2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form: powder
Colour: off-white
Odour: odourless
Melting point:

The substance / product decomposes
therefore not determined.

Flash point:

not applicable

Solubility in water: Forms a viscous solution.

Fire promoting properties: not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals: No corrosive effect on metal.

Formation of Start temperature: 220 °C

flammable gases:

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet

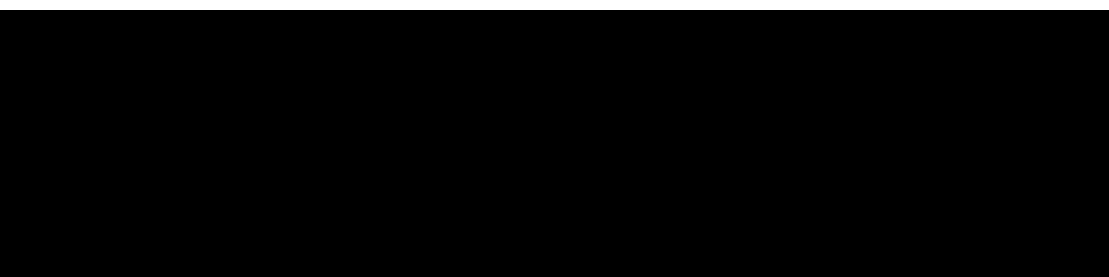


1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

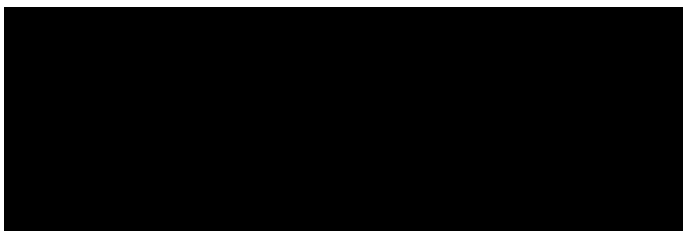
Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet



For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDSL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride . Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

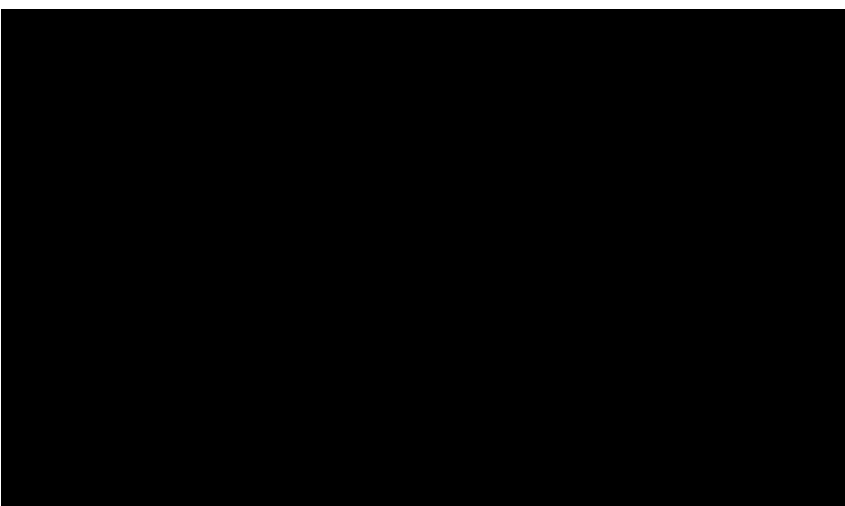
Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet



Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix I – Supernatant/Waimangaroa River Mixing Trial Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRO-RPT-00010

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	Revised	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	Use	Updated following client comments			G Smith	26/03/2026

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1 MIXING TRIAL – AMD SUPERNATANT WITH WAIMANGAROA RIVER WATER

To understand the effect of mixing the WTP treated water with a receiving water, the Waimangaroa River, the following tests were performed on the 16th of April 2025.

A sample of Waimangaroa River water was taken on 10-11 April 2025 (sampled by Bathurst staff) from near the Smokestack Compliance monitoring point.

The basis of the method comes from an email from Tony Jury to Gary Smith on 9th April 2025 outlining the methodology and testing required.

1.1 Method

Samples of Waimangaroa River water in 20 litre containers were sent to Process Flow in Richmond, Nelson.

The samples were mixed with Supernatant from previous Process Flow testing (Barrel Test 2) which represented a mostly compliant (except Aluminium) AMD treated water produced with Manchester St AMD with a mid range pH of 7.5-7.9.

The below mix ratios were achieved by the following method:

- Mixing vessel was 5L plastic bottle with lid (Deionised water triple rinsed between samples)
- Measure volume of Supernatant into Mixing vessel using 1L glass measuring cylinder or plastic syringe
- Measure volume of River Water into Mixing vessel using 1L glass measuring cylinder
- Replace lid on mixing vessel and invert 3-4 times
- Fill sample bottles for Laboratory analyses
- Triple rinse equipment with Deionised water between samples

1.2 Mix ratios

Table 1 presents the mixing ratios of supernatant (treated) water with the water sampled from the Waimangaroa River.

Table 1 Mix Ratios for Waimangaroa River Water and AMD Supernatant Mixing Trial

WTP EFFLUENT VOLUME (SUPERNATANT FROM SLUDGE CREATION BARREL TEST 2)	WAIMANGAROA RIVER RAW WATER VOLUME	MIX RATIOS (WTP:RIVER)
0.015L	1.5L	0.01:1 (Low WTP Flow)
0.15L	1.5L	0.1:1
0.5L	1L	0.5:1
1L	1L	1:1
1L	0.5L	2:1 (High WTP Flow)

1.3 Results

The WTP simulated treated supernatant and Waimangaroa River waters were tested and results of these waters unblended are compared below with the various mixed waters and analysed for compliance (see Tables 2 and 3). AMD WTP representative treated water Test 14S2 is also added for comparison.

For the Mixing trial supernatant results, mixing Waimangaroa and Barrel Manchester T2, 3 results complied with GVs. The Barrel Manchester T2 to Waimangaroa Test Ratio 0.5:1 complied with all metals GVs and all treated targets for pH, Turbidity and TSS.

The test mix of the 1:1 ratio complied with all metals GVs, but not the TSS treated target. The test mix 2:1 ratio complied with all metals GVs but not Turbidity and TSS treated targets. The test mixes 0.01:1 and the 0.1:1 mix ratios complied with all metals GVs except Aluminium at the 95% LoP and one at the 90% LoP. Treatment targets for pH, Turbidity and TSS were met for these samples.

If the WTP treated water supernatant is of a quality that is similar to the Manchester St treated water using Neutralisation/Coagulation/Flocculation and Settling processes as per Barrel Test 2 (30 Jan 25) and the Waimangaroa River Water is of the quality similar to the that sampled here, then the blending of the two waters has the potential to meet the modified guideline values.

Variability in Raw AMD influent to the WTP, variability in the treatment process and variability in the Waimangaroa river receiving waters, will need to be factored into the WTP design and any discharge of treated water to this river.

Note that subsequent to these tests, and because of the insufficient removal of some metals, particularly residual aluminium, further testing was trialled using processes to remove aluminium. The full treatment process plus the additional aluminium removal process were further trialled in final confirmation testing new raw water sampled of the three water types – Manchester St, Barren Valley Elf and S23. This is documented in detail in **PFL-2408-PRO-RPT-00014 - Appendix M - Confirmation Tests_Rev0**.

1.4 Mixing Trial April 2025 – Waimangaroa with Supernatant -Water Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 2 Mixing Trials April 2025 - Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 2 : 1 16-Apr-2025 2:00 pm	For Comparison T14S2-MAN 26-Aug-2024 4:00 pm
Hills Lab Number:		3839045.2	3862009.1	3862009.2	3862009.3	3862009.4	3862009.5	3668046.3
Sample		Manchester St New	Barrel Man T2 - 0.01 : 1 Waimangaroa	Barrel Man T2 0.1 : 1 Waimangaroa	Barrel Man T2 0.5 : 1 Waimangaroa	Barrel Man T2 1 : 1 Waimangaroa	Barrel Man T2 2 : 1 Waimangaroa	Manchester st
Neutralent		CaO	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO Barrel ManT2 /None Waimangaroa	CaO
Coagulant		Metalsorb	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb Barrel ManT2 /None Waimangaroa	Metalsorb
Flocculant		Rheomax	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax Barrel ManT2 /None Waimangaroa	Rheomax
Sediment added		None	None	None	None	None	None	0.3g/l
Rapid Mix time (Neutralisation)	minutes	20	None	None	None	None	None	20
Rapid Mix time for coagulant addition	minutes	1	None	None	None	None	None	1
Rapid Mix time for flocculant addition	minutes	1	None	None	None	None	None	1
Slow Mix Time	minutes	10	Invert 3-4 times	Invert 3-4 times	Invert 3-4 times	Invert 3-4 times	Invert 3-4 times	10
Settling Time		30 minutes	None	None	None	None	None	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	5L Bottle	5L Bottle	5L Bottle	5L Bottle	5L Bottle	Bench Jar 1 Litre

Table 3 Supernatant Water Quality Results – April 2025 Mixing Trials – Supernatant with Waimangaroa River Water

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 01 25	Waimangaroa Raw	Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025	Mix Trial Man 2 – 0.1 : 1 16-Apr-2025	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025	Mix Trial Man 2 – 1 : 1 16-Apr-2025	Mix Trial Man 2 – 2 : 1 16-Apr-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Turbidity	NTU	19.8	16.8	1.7	2.1	0.97	1.36	2	1.43	5.2	0.86
Turbidity Target	NTU				5	5	5	5	5	5	5
pH	pH	3.2	3.1	6.5	7.9	6.5	6.5	6.9	6.9	7	7.7
pH Target	pH				4.5-7	4.5-4	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Alkalinity ##	g/m3	<1	< 1.0	4	14.8	3.9	4.1	6.4	7.3	8.8	14.7
Hardness ##	g/m3	270	197	11	510	15.8	59	190	280	360	630
EC*	mS/m	114.4	103.7								
TSS***	g/m3	<70	17	< 3	9	< 3	< 3	4	8	9	5
TSS	g/m3				5	5	5	5	5	5	5
Aluminium #	g/m3	51	46	0.23	1.67	0.23	0.27	0.32	0.083	0.177	0.93
Al Chronic GV 95%	g/m3				0.24	0.15	0.26	0.36	0.25	0.20	0.48
Al Chronic GV 90%	g/m3				0.30	0.20	0.32	0.46	0.32	0.26	0.61
Al Chronic GV 80%	g/m3				0.42	0.27	0.44	0.63	0.44	0.35	0.83
Cadmium #	g/m3	0.00081	0.00082	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Cd Chronic GV 95%	g/m3				0.00037	0.00004 ****	0.00010	0.00027	0.00037	0.00037	0.00037
Cd Chronic GV 90%	g/m3				0.00069	0.00007	0.00019	0.00050	0.00069	0.00069	0.00069
Cd Chronic GV 80%	g/m3				0.00155	0.00015	0.00042	0.00112	0.00155	0.00155	0.00155
Calcium #	g/m3	69	53	2.6	183	4.4	19.9	67	101	129	220
Chromium #	g/m3	0.0051	0.0042	< 0.0005	0.0009	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0007	< 0.0005
Cobalt #	g/m3	0.094	0.085	0.0011	0.0007	0.0011	0.0011	0.0009	0.0009	0.0008	0.0026

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 01 25	Waimangaroa Raw	Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025	Mix Trial Man 2 - 1 : 1 16-Apr-2025	Mix Trial Man 2 - 2 : 1 16-Apr-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Co Chronic GV 95%	g/m3				0.0033	0.0014	0.0015	0.0024	0.0029	0.0032	0.0033
Co Chronic GV 90%	g/m3				0.0078	0.0033	0.0035	0.0057	0.0067	0.0075	0.0078
Co Chronic GV 80%	g/m3				0.0208	0.0090	0.0094	0.0153	0.0180	0.0200	0.0208
Copper #	g/m3	0.0133	0.0148	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cu Chronic GV 95%					0.0007	0.0030	0.0029	0.0020	0.0012	0.0008	0.0016
Cu Chronic GV 90%					0.0009	0.0036	0.0035	0.0024	0.0014	0.0010	0.0020
Cu Chronic GV 80%					0.0014	0.0057	0.0055	0.0038	0.0023	0.0016	0.0032
Iron #	g/m3	13.2	3.5	0.09	0.02	0.09	0.08	0.04	0.02	0.02	0.02
Fe Chronic GV 80% /90%/95%	g/m3				1	1	1	1	1	1	1.0
Lead #	g/m3	0.00136	0.00159	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Magnesium #	g/m3	24	15.6	1.08	13.4	1.14	2.3	5.5	7.8	9.7	22
Manganese #	g/m3	1.99	1.41	0.04	0.158	0.042	0.053	0.083	0.107	0.121	0.49
Manganese Chronic GV 95%	g/m3				1.12	0.32	0.46	0.75	0.88	0.97	1.22
Manganese Chronic GV 90%	g/m3				1.72	0.50	0.71	1.15	1.35	1.49	1.88
Manganese Chronic GV 80%	g/m3				2.81	0.81	1.16	1.88	2.20	2.44	3.07
Nickel #	g/m3	0.23	0.2	0.0019	0.0032	0.0018	0.002	0.0022	0.0019	0.0019	0.0115
Nickel Chronic GV 95%	g/m3				0.099	0.011	0.020	0.053	0.073	0.091	0.099

PF Test Identifier and Date Sent for Analysis		Manchester St Raw Water Sample	Manchester St New Raw Water Sample 30 01 25	Waimangaroa Raw	Barrel MAN Test 2 Supernatant 30-Jan-2025	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025	Mix Trial Man 2 - 1 : 1 16-Apr-2025	Mix Trial Man 2 - 2 : 1 16-Apr-2025	T14S2-MAN 26-Aug-2024 4:00 pm
Nickel Chronic GV 90%	g/m3				0.118	0.013	0.023	0.062	0.087	0.107	0.118
Nickel Chronic GV 80%	g/m3				0.154	0.017	0.030	0.082	0.113	0.141	0.154
Zinc #	g/m3	1.11	0.99	0.0083	< 0.0010	0.0078	0.0069	0.0049	0.0026	< 0.0010	< 0.0010
Zinc Chronic GV 95%	g/m3				0.036	0.012	0.040	0.071	0.077	0.073	0.067
Zinc Chronic GV 90%	g/m3				0.054	0.018	0.060	0.106	0.114	0.109	0.100
Zinc Chronic GV 80%	g/m3				0.092	0.030	0.102	0.183	0.196	0.187	0.172
DOC	g/m3		0.8	3.7	< 0.5	3.7	3.5	2.1	1	0.6	1.6
Absorbance at 254 nm	AU cm-1	0.518	0.109	0.142	0.013	0.142	0.12	0.077	0.026	0.015	0.013
Transmittance at 254 nm	%T, 1 cm cell	30.3		72	97.1	72.1	75.8	83.8	94.2	96.7	97.1
Iron + Mn #		15.19	4.91	0.13	0.178	0.132	0.133	0.123	0.127	0.141	0.51
Iron + Mn Chronic GV 80%/90%/95%					2.12	1.32	1.46	1.75	1.88	1.97	2.22
Thallium #	g/m3			0.00007	-	0.00007	0.0002	0.0005	0.00071	0.00092	-
Sulphate	g/m3			6.6	-	11.3	50	172	250	340	-
Potassium #	g/m3			0.43	-	0.5	1.12	2.9	4.5	5.5	-
Sodium #	g/m3			2.9	-	3	3.2	3.1	3.5	3.5	-
Acidity (pH 5.5)	g/m3 CaCO3			< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-
Acidity (pH 7.0)	g/m3 CaCO3			2	-	2	1.5	1.5	1	< 1.0	-
Total Acidity (pH 8.3)	g/m3 CaCO3			6	-	4	6	4.5	4	6.5	-

Dissolved Metals

*DOC – Dissolved Organic Carbon

**EC Electrical Conductivity

##Total, as CaCO₃

***TSS

**** Cd - indicates that GV is less than the trace LOQ

APPENDIX A –WATER QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3638113-SP-2

3668046-SP-2

3839044-SP-1

3839045-SP-1

3862009-SP-1

Sample Type: Potable Water

Sample Name:		BAR ELF Raw 29-Jul-2024 3:00 pm	S23 Raw 29-Jul-2024 2:40 pm	MAN Raw 29-Jul-2024 2:15 pm
Lab Number:		3638113.1	3638113.2	3638113.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	1.69	0.32	19.8
pH	pH Units	3.4	2.6	3.2
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	158	1,560	440
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	90	810	270
Electrical Conductivity (EC)	mS/m	47.6	339	114.4
Total Suspended Solids	g/m ³	< 8	< 8	< 70
Total Solids (TS)	g/m ³	300	3,400	1,000
Dissolved Aluminium	g/m ³	10.0	168	51
Dissolved Arsenic	g/m ³	< 0.0010	0.036	< 0.0010
Dissolved Cadmium	g/m ³	0.00034	0.0026	0.00081
Dissolved Calcium	g/m ³	31	169	69
Dissolved Chromium	g/m ³	0.0010	0.077	0.0051
Dissolved Cobalt	g/m ³	0.048	0.24	0.094
Dissolved Copper	g/m ³	0.0161	0.055	0.0133
Dissolved Iron	g/m ³	7.1	89	13.2
Dissolved Lead	g/m ³	0.0057	0.00017	0.00136
Dissolved Magnesium	g/m ³	3.2	93	24
Dissolved Manganese	g/m ³	0.47	7.9	1.99
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	0.096	0.68	0.23
Total Sodium	g/m ³	2.4	4.7	4.2
Dissolved Zinc	g/m ³	0.60	3.9	1.11
Chloride	g/m ³	3.6	6.1	4.3
Sulphate	g/m ³	186	2,400	690
Absorbance at 254 nm	AU cm ⁻¹	0.191	3.11	0.518
Transmittance at 254 nm*	%T, 1 cm cell	64.4	< 0.5	30.3

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Potable Water

Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3



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Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1, 3
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3

Sample Type: Potable Water			
Test	Method Description	Default Detection Limit	Sample No
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

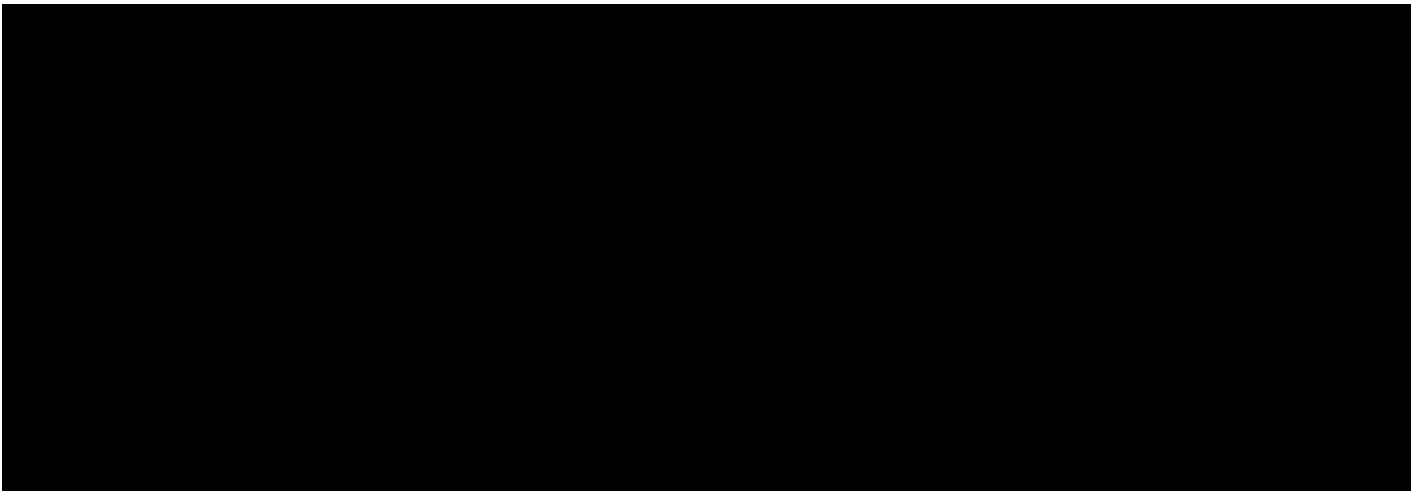
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 31-Jul-2024 and 08-Aug-2024. 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.

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**Sample Type: Aqueous**

Sample Name:		T6 MAN J1J2 19-Aug-2024 11:00 am	T13J4- S23 23-Aug-2024 4:00 pm	T14S2-MAN 26-Aug-2024 4:00 pm	T14S1-S23 26-Aug-2024 4:00 pm	T15S2-ELF 27-Aug-2024 12:00 pm
Lab Number:		3668046.1	3668046.2	3668046.3	3668046.4	3668046.5
Turbidity	NTU	1.77	1.20	0.86	0.99	1.44
pH	pH Units	7.2	7.3	7.7	6.6	7.6
Total Alkalinity	g/m ³ as CaCO ₃	11.1	10.9	14.7	7.1	21
Total Hardness	g/m ³ as CaCO ₃	640	2,300	630	2,200	200
Total Suspended Solids	g/m ³	< 3	< 3	5	< 3	3
Dissolved Aluminium	g/m ³	0.119	0.41	0.93	0.036	0.49
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005
Dissolved Calcium	g/m ³	70	173	220	700	76
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0021	< 0.0005
Dissolved Cobalt	g/m ³	0.0138	0.040	0.0026	0.052	0.0057
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	112	450	22	102	3.4
Dissolved Manganese	g/m ³	1.15	4.8	0.49	3.7	0.24
Dissolved Nickel	g/m ³	0.077	0.165	0.0115	0.198	0.022
Dissolved Zinc	g/m ³	0.0046	0.0061	< 0.0010	0.037	0.0015
Dissolved Organic Carbon (DOC)	g/m ³	1.6	1.0	1.6	0.8	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.021	0.013	0.015	0.011
Transmittance at 254 nm*	%T, 1 cm cell	97.4	95.4	97.1	96.5	97.6

Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Turbidity	NTU	0.53	1.20	0.61	1.26	0.51
pH	pH Units	7.6	7.5	7.0	7.0	7.0
Total Alkalinity	g/m ³ as CaCO ₃	16.7	17.2	12.6	12.2	11.9
Total Hardness	g/m ³ as CaCO ₃	650	650	640	630	640
Total Suspended Solids	g/m ³	6	7	5	5	6
Dissolved Aluminium	g/m ³	0.99	0.79	0.155	0.130	0.126
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	220	220	220	220	220
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0025	0.0025	0.0085	0.0095	0.0094
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	23	23	23	23	24



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Sample Type: Aqueous						
Sample Name:		C1T1 P1500 29-Aug-2024 9:30 am	C1T1 30MIN P1 28-Aug-2024	C1T3-15MIN-P1 29-Aug-2024 12:50 pm	C1T3-30MIN-P1 29-Aug-2024 1:04 pm	C1T3 NEXTDAY P1 30-Aug-2024 11:20 am
Lab Number:		3668046.6	3668046.7	3668046.8	3668046.9	3668046.10
Dissolved Manganese	g/m ³	0.49	0.49	0.90	0.91	0.92
Dissolved Nickel	g/m ³	0.0120	0.0117	0.037	0.040	0.039
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.0059	0.0085	0.0100
Dissolved Organic Carbon (DOC)	g/m ³	1.8	1.5	1.5	1.4	1.1
Absorbance at 254 nm	AU cm ⁻¹	0.009	0.008	0.006	0.009	0.014
Transmittance at 254 nm*	%T, 1 cm cell	97.9	98.3	98.5	98.1	96.9

Sample Name:		C2T5 60MINP1 30-Aug-2024 1:35 pm	C2T5 NEXTDAY P1 31-Jul-2024 9:10 am	T6C3 40MINP1 30-Aug-2024 4:36 pm	T6C3 NEXTDAY P1 31-Jul-2024 9:10 am	T7C3 30 MINP1 03-Sep-2024 3:15 pm
Lab Number:		3668046.11	3668046.12	3668046.13	3668046.14	3668046.15
Turbidity	NTU	4.3	1.44	3.7	1.88	0.95
pH	pH Units	8.1	8.0	7.2	7.2	6.9
Total Alkalinity	g/m ³ as CaCO ₃	23	21	12.7	12.4	7.9
Total Hardness	g/m ³ as CaCO ₃	2,200	2,200	196	197	620
Total Suspended Solids	g/m ³	16	9	9	4	6
Dissolved Aluminium	g/m ³	1.08	1.10	0.027	0.026	0.024
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00007	0.00007	0.00023
Dissolved Calcium	g/m ³	720	730	73	73	210
Dissolved Chromium	g/m ³	0.0032	0.0033	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	< 0.0002	< 0.0002	0.028	0.028	0.038
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	95	97	3.5	3.6	24
Dissolved Manganese	g/m ³	0.40	0.48	0.37	0.38	1.29
Dissolved Nickel	g/m ³	< 0.0005	0.0005	0.069	0.067	0.116
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	0.069	0.067	0.052
Dissolved Organic Carbon (DOC)	g/m ³	1.4	0.8	0.9	1.2	1.2
Absorbance at 254 nm	AU cm ⁻¹	0.015	0.019	0.010	0.010	0.012
Transmittance at 254 nm*	%T, 1 cm cell	96.7	95.8	97.7	97.7	97.4

Sample Name:		T7C3-ND-P1 04-Sep-2024 9:47 am	T8C2 30MIN P1 04-Sep-2024 11:15 am	T8C2 NDP1 05-Sep-2024 11:30 am	T9C1 30MIN P1 04-Sep-2024 3:00 pm	T9C1 ND P1 05-Sep-2024 11:30 am
Lab Number:		3668046.16	3668046.17	3668046.18	3668046.19	3668046.20
Turbidity	NTU	0.90	3.0	1.97	0.84	0.84
pH	pH Units	6.9	7.3	7.2	7.7	7.7
Total Alkalinity	g/m ³ as CaCO ₃	7.8	11.8	11.1	17.4	16.9
Total Hardness	g/m ³ as CaCO ₃	630	2,100	2,200	210	210
Total Suspended Solids	g/m ³	4	12	8	6	6
Dissolved Aluminium	g/m ³	0.022	0.27	0.29	0.58	0.58
Dissolved Cadmium	g/m ³	0.00023	0.00006	0.00007	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	210	700	730	76	78
Dissolved Chromium	g/m ³	< 0.0005	0.0030	0.0032	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.037	0.0021	0.0023	0.0051	0.0055
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	24	93	100	3.4	3.4
Dissolved Manganese	g/m ³	1.33	1.22	1.25	0.190	0.195
Dissolved Nickel	g/m ³	0.114	0.0007	0.0008	0.020	0.021
Dissolved Zinc	g/m ³	0.049	0.0018	0.0025	0.0016	0.0022
Dissolved Organic Carbon (DOC)	g/m ³	1.2	1.4	1.4	1.2	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.013	0.017	0.010	0.011
Transmittance at 254 nm*	%T, 1 cm cell	99.0	97.0	96.2	97.7	97.4

Analyst's Comments

Sample 20 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the DOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces report '3668046-SPv1' issued on 17-Sep-2024 at 2:08 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-20
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-20
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-20
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-20
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-20
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-20
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-20
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-20
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-20
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-20
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-20
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-20

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

Testing was completed between 10-Sep-2024 and 17-Jun-2025. 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.

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Sample Type: Aqueous			
Sample Name:		S23 New Jan 25 16-Jan-2025	Manchester St New Raw Jan 25 30-Jan-2025
Lab Number:		3839044.1	3839044.2
Individual Tests			
True Hazen Colour	Hazen units	< 10	< 10
Turbidity	NTU	1.08	16.8
pH	pH Units	2.6	3.1
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	1,970	350
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	1,110	197
Electrical Conductivity (EC)	mS/m	381	103.7
Total Suspended Solids	g/m ³	5	17
Total Solids (TS)	g/m ³	4,400	770
Dissolved Aluminium	g/m ³	220	46
Dissolved Calcium	g/m ³	199	53
Dissolved Cobalt	g/m ³	0.36	0.085
Dissolved Iron	g/m ³	170	3.5
Dissolved Magnesium	g/m ³	150	15.6
Dissolved Manganese	g/m ³	11.6	1.41
Dissolved Mercury	g/m ³	< 0.002	< 0.002
Total Sodium	g/m ³	3.8	3.6
Chloride	g/m ³	5.4	3.6
Sulphate	g/m ³	3,100	540
Dissolved Organic Carbon (DOC)	g/m ³	1.1	0.8
Total Organic Carbon (TOC)	g/m ³	1.8	2.0
Absorbance at 254 nm	AU cm ⁻¹	6.31	0.109
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn			
Dissolved Arsenic	g/m ³	0.066	< 0.0010
Dissolved Cadmium	g/m ³	0.0037	0.00082
Dissolved Chromium	g/m ³	0.107	0.0042
Dissolved Copper	g/m ³	0.084	0.0148
Dissolved Lead	g/m ³	< 0.0010	0.00159
Dissolved Nickel	g/m ³	1.02	0.20
Dissolved Zinc	g/m ³	5.8	0.99



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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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m ³	1-2
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-2
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-2
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-2
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-2
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-2
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-2
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-2
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-2
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-2
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-2
Dissolved Mercury	Filtered sample, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.002 g/m ³	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-2
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-2

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-2
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-2

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

Testing was completed between 01-Apr-2025 and 07-Apr-2025. 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.

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Sample Type: Aqueous						
Sample Name:		Barrel Test 7 OLD MAN Supernatant Jan 25 31-Jan-2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 10 523 New Supernatant 31-Jan-2025
Lab Number:		3839045.1	3839045.2	3839045.3	3839045.4	3839045.5
Turbidity	NTU	3.2	2.1	1.23	1.59	12.8
pH	pH Units	8.0	7.9	10.9	9.7	7.4
Total Alkalinity	g/m ³ as CaCO ₃	17.8	14.8	102	48	15.5
Total Hardness	g/m ³ as CaCO ₃	620	510	580	520	1,930
Total Suspended Solids	g/m ³	26	9	6	15	118
Dissolved Aluminium	g/m ³	1.50	1.67	14.9	7.7	0.096
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	183	230	210	600
Dissolved Chromium	g/m ³	0.0013	0.0009	0.0013	0.0012	0.0041
Dissolved Cobalt	g/m ³	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	12.8	13.4	0.08	0.56	107
Dissolved Manganese	g/m ³	0.0018	0.158	< 0.0005	< 0.0005	0.31
Dissolved Nickel	g/m ³	< 0.0005	0.0032	< 0.0005	< 0.0005	0.0009
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Organic Carbon (DOC)	g/m ³	0.6	< 0.5	0.6	< 0.5	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.006	0.013	0.004	0.015	0.014
Transmittance at 254 nm*	%T, 1 cm cell	98.5	97.1	99.1	96.6	96.8

Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Turbidity	NTU	2.1	0.56	3.3
pH	pH Units	8.7	8.0	7.7
Total Alkalinity	g/m ³ as CaCO ₃	23	15.0	13.4
Total Hardness	g/m ³ as CaCO ₃	640	660	630
Total Suspended Solids	g/m ³	14	4	7
Dissolved Aluminium	g/m ³	3.8	1.26	0.94
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	230	230	220
Dissolved Chromium	g/m ³	0.0012	0.0008	0.0008
Dissolved Cobalt	g/m ³	< 0.0002	0.0052	0.0044
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	17.1	22	21



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous				
Sample Name:		HDS Test 1 Supernatant 26-Feb-2025	HDS Test 20 Supernatant 21-Mar-2025	Makeup T1 J1 J2 27-Mar-2025 2:15 pm
Lab Number:		3839045.6	3839045.7	3839045.8
Dissolved Manganese	g/m³	0.035	0.51	0.58
Dissolved Nickel	g/m³	< 0.0005	0.0149	0.0189
Dissolved Zinc	g/m³	< 0.0010	0.0011	< 0.0010
Dissolved Organic Carbon (DOC)	g/m³	< 0.5	0.7	0.5
Absorbance at 254 nm	AU cm ⁻¹	0.007	0.008	0.008
Transmittance at 254 nm*	%T, 1 cm cell	98.5	98.2	98.1

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-8
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-8
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-8
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-8
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-8
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-8
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-8
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-8
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-8
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-8
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-8
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-8
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-8
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-8
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-8
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-8
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-8

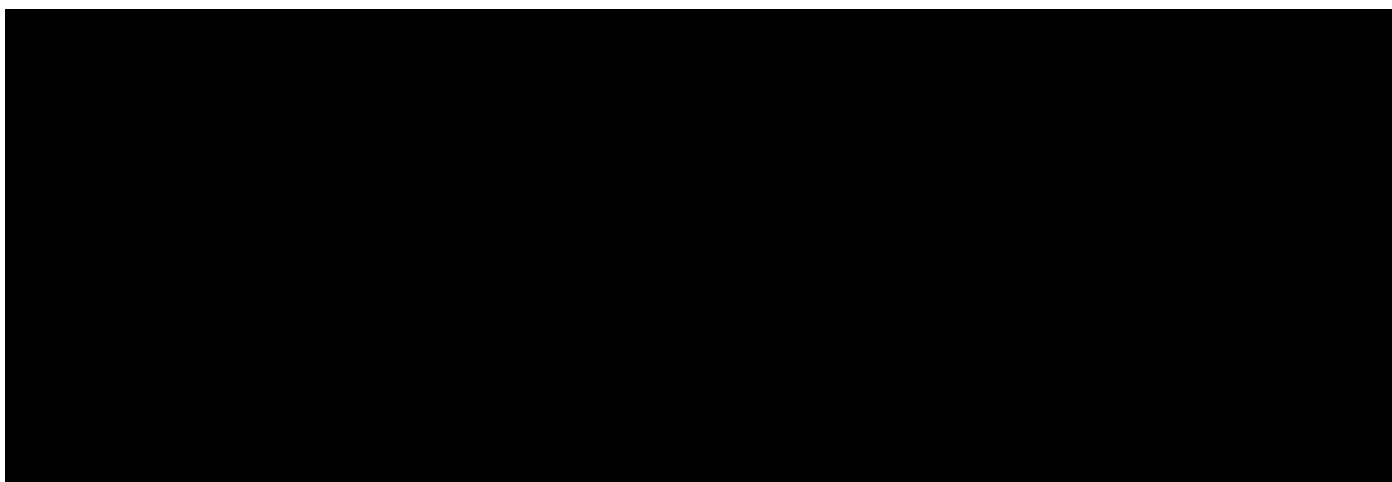
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 03-Apr-2025 and 11-Apr-2025. 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.

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Sample Type: Aqueous

Sample Name:	Mix Trial Man 2 - 0.01 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 0.1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 0.5 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 1 : 1 16-Apr-2025 2:00 pm	Mix Trial Man 2 - 2 : 1 16-Apr-2025 2:00 pm
Lab Number:	3862009.1	3862009.2	3862009.3	3862009.4	3862009.5

Individual Tests						
Turbidity	NTU	0.97	1.36	2.0	1.43	5.2
pH	pH Units	6.5	6.5	6.9	6.9	7.0
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Acidity (pH 7.0)	g/m ³ as CaCO ₃	2.0	1.5	1.5	1.0	< 1.0
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	4.0	6.0	4.5	4.0	6.5
Total Alkalinity	g/m ³ as CaCO ₃	3.9	4.1	6.4	7.3	8.8
Total Suspended Solids	g/m ³	< 3	< 3	4	8	9
Dissolved Aluminium	g/m ³	0.23	0.27	0.32	0.083	0.177
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0007
Dissolved Cobalt	g/m ³	0.0011	0.0011	0.0009	0.0009	0.0008
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	0.09	0.08	0.04	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Manganese	g/m ³	0.042	0.053	0.083	0.107	0.121
Dissolved Nickel	g/m ³	0.0018	0.0020	0.0022	0.0019	0.0019
Dissolved Thallium	g/m ³	0.00007	0.00020	0.00050	0.00071	0.00092
Dissolved Zinc	g/m ³	0.0078	0.0069	0.0049	0.0026	< 0.0010
Sulphate	g/m ³	11.3	50	172	250	340
Dissolved Organic Carbon (DOC)	g/m ³	3.7	3.5	2.1	1.0	0.6
Absorbance at 254 nm	AU cm ⁻¹	0.142	0.120	0.077	0.026	0.015
Transmittance at 254 nm*	%T, 1 cm cell	72.1	75.8	83.8	94.2	96.7

Cation Profile						
Total Hardness	g/m³ as CaCO₃	15.8	59	190	280	360
Dissolved Calcium	g/m³	4.4	19.9	67	101	129
Dissolved Magnesium	g/m³	1.14	2.3	5.5	7.8	9.7
Dissolved Potassium	g/m³	0.50	1.12	2.9	4.5	5.5
Dissolved Sodium	g/m³	3.0	3.2	3.1	3.5	3.5

Sample Name:	Waimangaroa Raw 16-Apr-2025 2:00 pm
Lab Number:	3862009.6

Individual Tests					
Turbidity	NTU	1.70			
pH	pH Units	6.5			
Acidity (pH 5.5)	g/m ³ as CaCO ₃	< 1.0			
Acidity (pH 7.0)	g/m ³ as CaCO ₃	2.0			
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	6.0			



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Sample Type: Aqueous		
Sample Name:		Waimangaroa Raw 16-Apr-2025 2:00 pm
Lab Number:		3862009.6
Individual Tests		
Total Alkalinity	g/m ³ as CaCO ₃	4.0
Total Suspended Solids	g/m ³	< 3
Dissolved Aluminium	g/m ³	0.23
Dissolved Cadmium	g/m ³	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005
Dissolved Cobalt	g/m ³	0.0011
Dissolved Copper	g/m ³	0.0005
Dissolved Iron	g/m ³	0.09
Dissolved Lead	g/m ³	< 0.00010
Dissolved Manganese	g/m ³	0.040
Dissolved Nickel	g/m ³	0.0019
Dissolved Thallium	g/m ³	0.00007
Dissolved Zinc	g/m ³	0.0083
Sulphate	g/m ³	6.6
Dissolved Organic Carbon (DOC)	g/m ³	3.7
Absorbance at 254 nm	AU cm ⁻¹	0.142
Transmittance at 254 nm*	%T, 1 cm cell	72.0
Cation Profile		
Total Hardness	g/m ³ as CaCO ₃	11.0
Dissolved Calcium	g/m ³	2.6
Dissolved Magnesium	g/m ³	1.08
Dissolved Potassium	g/m ³	0.43
Dissolved Sodium	g/m ³	2.9

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Cation Profile		-	1-6
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-6
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-6
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-6
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-6
Total Acidity (pH 5.5)	Titration to pH 5.5 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Acidity (pH 7.0)	Titration to pH 7.0 with standard sodium hydroxide solution, pH meter. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-6

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry, Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-6
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-6
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-6
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-6
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-6
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-6
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-6
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-6
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-6
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-6
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-6
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-6
Dissolved Thallium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-6
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-6
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-6
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-6
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-6
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-6

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

Testing was completed between 19-Apr-2025 and 24-Apr-2025. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



APPENDIX B – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-24-NW-046418-01	REPORT DATE	05/08/2024
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Attention	
Phone	
Email	

Contact for your orders:		Order code:	EUNZWE-00196988
Contract:	Contract for Graymont (NZ) Limited	Purchase Order Number:	1017166
Submission Reference:	Mak Oxd		

SAMPLE CODE	812-2024-00109651		
Sample Name	Makareao Oxide 13-17/7		
Sample Reference	Makareao Oxide		
Reception Date & Time:	02/08/2024 9:30		
Analysis Started on:	03/08/2024	Analysis Ending Date:	05/08/2024
Product Type	Quicklime	Sampled Date & Time	30/07/2024 00:00
Sampler(s)	CUSTOMER		

RESULTS			LOQ
NW499	Arsenic - Total		
	Arsenic (As)	0.34 mg/kg	0.05
NW504	Cadmium - Total		
	Cadmium (Cd)	0.64 mg/kg	0.01
NW507	Chromium - Total		
	Chromium (Cr)	8.8 mg/kg	0.2
NW509	Copper - Total		
	Copper (Cu)	1.3 mg/kg	0.3
NW511	Lead - Total		
	Lead (Pb)	0.5 mg/kg	0.1
NW515	Mercury - Total		
	Mercury (Hg)	<0.1 mg/kg	0.1
NW517	Nickel - Total		
	Nickel (Ni)	1.2 mg/kg	0.2

LIST OF METHODS			
NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature

& Water Testing



EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received.

Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT

SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15
 New Zealand Supplier:
 Address:
 Telephone:
 Emergency No:
 Website:
 Date of SDS Preparation:

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **MAGNESIUM OXIDE 87%**

Recommended Use of the Chemical Fertilizer.
and Restrictions on Use

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/7

BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

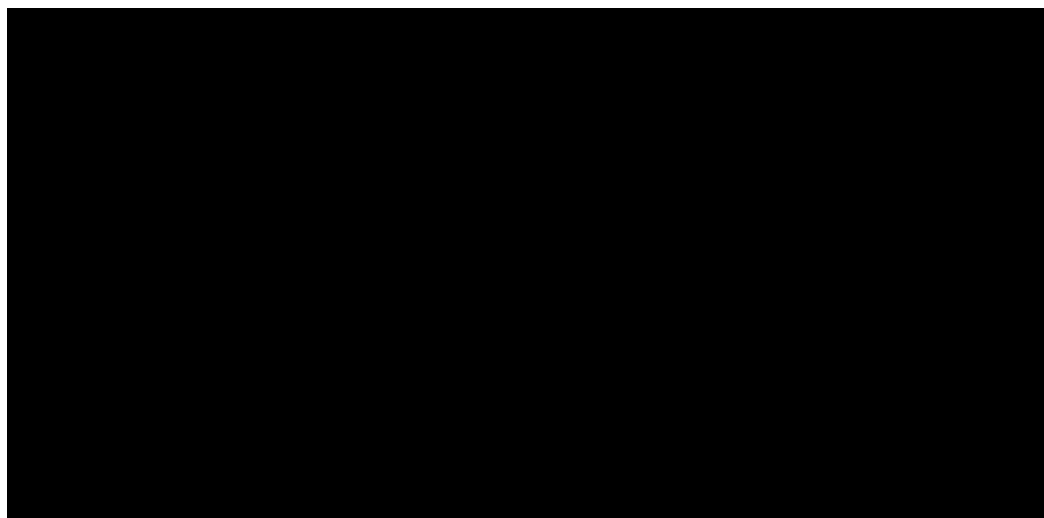
(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier



2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation.

Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

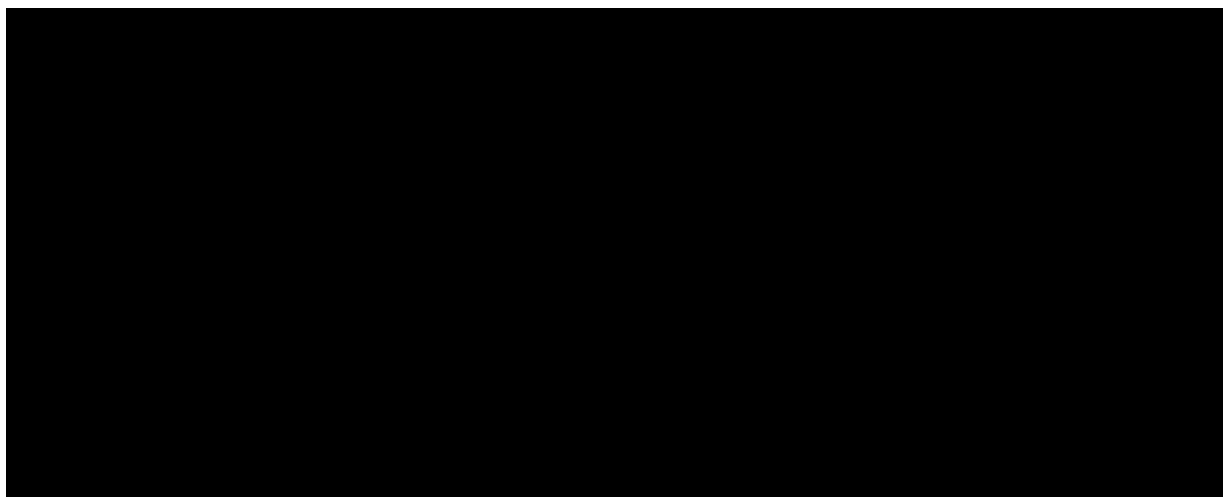
1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent



2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form: powder

Colour: off-white

Odour: odourless

Melting point:

The substance / product decomposes
therefore not determined.

Flash point:

not applicable

Solubility in water: Forms a viscous solution.

Fire promoting properties: not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals: No corrosive effect on metal.

Formation of Start temperature: 220 °C

flammable gases:

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

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Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

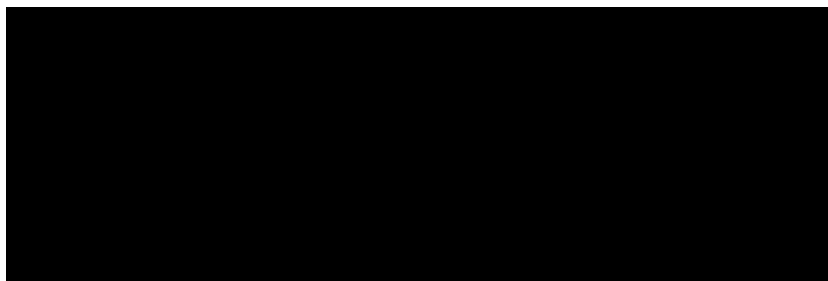
Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.

Supplier:
NZBN:
Street Address:

Telephone Number:
Facsimile:
Emergency Telephone:



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet

[REDACTED]

[REDACTED]

For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures****General advice**

For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number**Inhalation**

Remove to fresh air. Call a physician if symptoms occur.

Eye contact

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact

Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion

Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed**Symptoms**

No information available.

Indication of any immediate medical attention and special treatment needed**Note to physicians**

Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media****Suitable Extinguishing Media**

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media

No information available.

Specific hazards arising from the chemical**Specific hazards arising from the chemical**

Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.
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6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.
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For emergency responders	Use personal protection recommended in Section 8.
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Environmental precautions

Environmental precautions	See Section 12 for additional Ecological Information.
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Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
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Methods for cleaning up	Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.
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Precautions to prevent secondary hazards

Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.
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7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.
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Conditions for safe storage, including any incompatibilities

Storage Conditions	Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.
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Incompatible materials	Interhalogens.
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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits	No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):
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Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

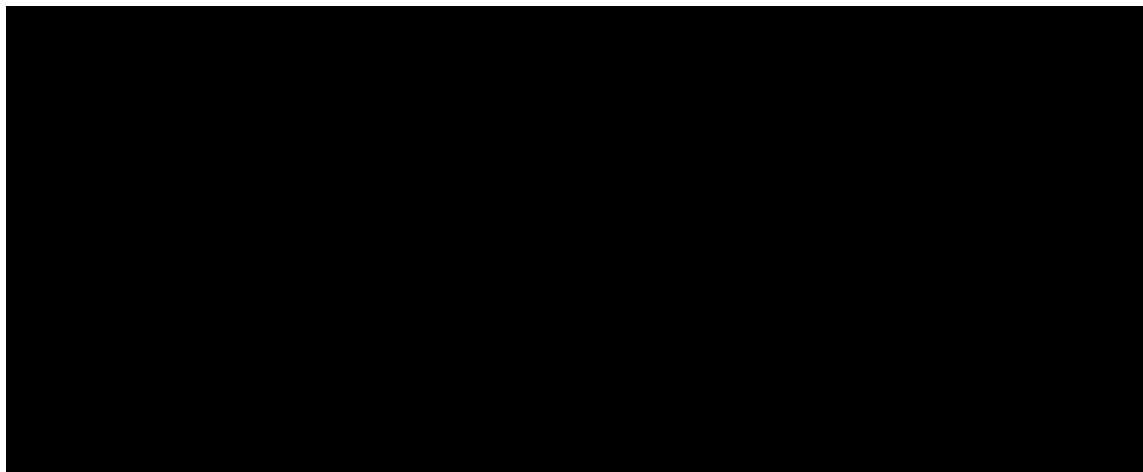
This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.
Subclass 6.3 Category A - Substances that are irritating to the skin.
Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017
Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

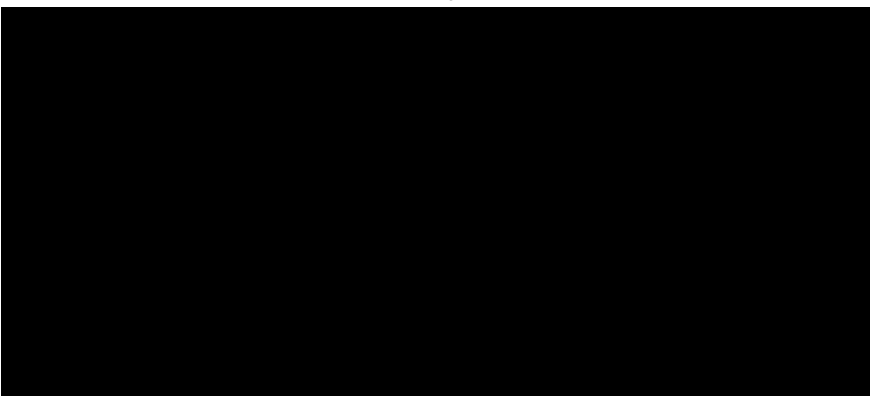
Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet



1.4. Emergency telephone number

24-hour emergency number: 1 800 033 111

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix J - Supernatant pH Trimming Tests

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRO-RPT-00011

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated following client comments				26/03/2026

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1 POST TREATMENT SUPERNATANT TESTING

This section describes the testing that was performed on post treated water which is Simulated WTP supernatant from PFL testing.

The work involved the following:

- Post WTP Treatment pH adjustment with Citric Acid and
- Carbon Dioxide and Sulphuric Acid pH adjustment of WTP Treated Supernatant

1.1 Post WTP Treatment pH adjustment with Citric Acid

In the initial testing, documented in PFL-2408-PRO-RPT-00002, citric acid was trialled as a pH adjustment chemical on the Treated Supernatant. This work is summarised here in this report for completeness.

Based on the results of the jar and column testing, some final pH adjustment will be required. The pH target used as the basis for this investigation indicate a final pH between 4.5-7 is required.

The final pH of the supernatant in the column, jar tests and barrel tests carried out were in the order of pH 5-9. In drinking water treatment, citric acid is often used for pH adjustment.

Citric Acid is a weak organic acid and is just one of several pH adjustment methods. Another common pH adjustment method is CO₂ gas. The various methods can have different effects on the final water quality and further optimisation is necessary to determine an appropriate pH correction method and its effect on the supernatant.

The citric testing presented here simulates post polishing adjustment. The point in the process at which pH is adjusted should also be given further consideration as prior to final polishing may be preferable to post polishing.

To gauge the amount of citric acid that may be required to adjust the pH of the supernatant from the proposed Escarpment WTP discharge, testing was carried out on three supernatant samples taken from the experimental settling columns.

1.2 Method

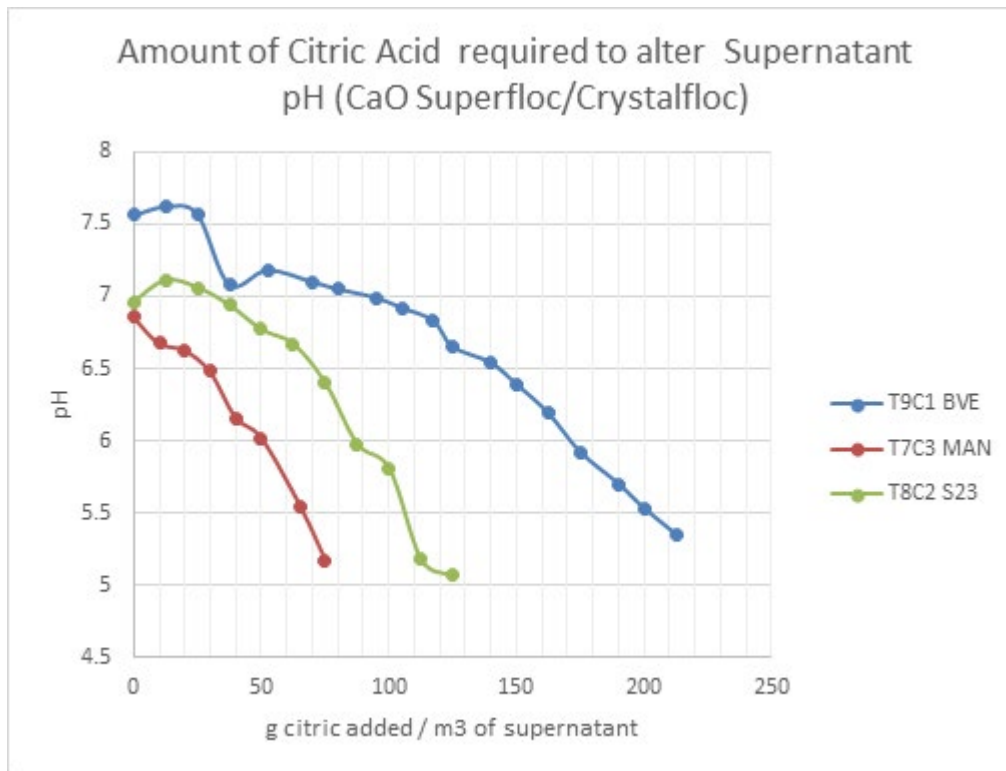
1. Samples were taken from Column tests 7, 8 & 9 after approximately 24hrs settling, (simulating discharge from a polishing pond)
2. A 1% Citric Acid solution was prepared (1g citric acid powder dissolved in 100mL of Deionised water)
3. Citric acid solution was added drop-wise using a 1mL tuberculin syringe to a 200mL sample of supernatant
4. After each drop was mixed in and pH stabilised, the pH was recorded
5. Total number of drops added as well as total volume of citric acid solution was recorded

Results

- Figure 1 presents the pH results from the addition of citric acid to three supernatant water samples. The following remarks are made.
- Manchester/CaO/Crystalfloc/Superfloc. To lower pH from 6.86 to 6.5 required 30g citric per m3 of supernatant.
- S23/CaO/Crystalfloc/Superfloc. To lower pH from 6.96 to 6.5 required 75g citric per m3 of supernatant.
- Barron Valley ELF/CaO/Crystalfloc/Superfloc. To lower pH from 7.56 to 6.5 required 145g citric per m3 of supernatant.

No further testing using Citric Acid was pursued. CO₂ and Sulphuric acid were used in further testing and are documented in the next section.

Figure 1 pH Change with Citric Addition



2. CARBON DIOXIDE AND SULPHURIC ACID PH ADJUSTMENT OF WTP TREATED SUPERNATANT

The purpose of these trials was to determine a rough order estimate of the quantities of either Carbon Dioxide or Sulphuric Acid that would be required for site pH adjustment at a proposed Water Treatment plant, to bring the treated water to a pH target prior to discharge. The overall pH Target is pH 4.5-7.0. It was also to determine if the pH would rebound (rise after minutes or hours due to degassing) after Carbon Dioxide dosing.

2.1 Method

The pH 5-5.2 was the process target pH of these adjustment trials.

A Proprietary CO₂ sparging device was used for dosing CO₂ at low pressure (Note, in a WTP situation this would be done under higher pressure to achieve more efficient a dissolution of CO₂ gas. For further more accurate testing in the future a pilot device could be procured).

The general pH adjustment method was the same as was used in the MSR pH adjustment trials with Carbon Dioxide and Sulphuric acid as described in Report PFL-2408-PRJ-RPT-00003 Memo MSR Effluent Testing – October 2024 Rev A and it is described below:

2.1.1 Bench Scale Process Testing Methods

The following describes the detailed test method used for the bench tests discussed in this report.

Bench Testing Equipment:

- A Boltac Infinity Jar Stirrer and four 1 litre jars were used for rapid and slow mixing process phases.
- Eight x 1 litre glass graduated cylinders were used for bench mixing trials.
- Hach DR3900 Spectrophotometer was used for dissolved metals, alkalinity and hardness testing.
- Realtech UVT meter used for UVT254 measurement
- Hanna Handheld Turbidimeter used for Turbidity measurement
- Hanna Bench top pH Meter for pH measurement

Figure 2 The Boltac Infinity jar test mixing unit and Graduated Cylinders



2.1.2 Contamination prevention

To prevent metals contamination between tests, after testing each run, the jars and cylinders were cleaned with Pyroneg detergent and rinsed with deionised water.

2.1.3 Carbon Dioxide Dosing

The CO₂ purpose was to see if there was any pH rebounding if degassing occurs.

A sample of Supernatant was dosed with CO₂ to alter the pH of the sample.

The amount of CO₂ was not measured for these tests as the purpose was not to determine quantity of CO₂ required to change pH but just to observe if any rebounding of pH was occurring with degassing.

The following method was used to dose CO₂:

- Fill 840mls of test water in sample bottle
- Take initial pH
- Sparge with CO₂ for 1 or 2 seconds
- Remove and measure pH
- Remeasure pH after 5 mins
- Decant sample into Jar
- For sample CT14: Remeasure pH after a period of resting (5 mins, 1 hr)
- For sample CT16: Remeasure pH after: 1hr resting period; followed by 20mins of slow stirring; and after further resting (6 days).

2.1.4 Titrations for pH Adjustment and Alkalinity Testing using Sulphuric Acid (H₂SO₄)

The following method was used to adjust pH of the Supernatant using Sulphuric Acid 1%:

- 1L sample in Jar stirrer with speed set to 350RPM
- Record initial pH
- Add Sulphuric acid (1 % v/v solution) in increments and wait 1 minute after each addition to allow pH to stabilise
- Continue until pH 6.4 has been reached
- Record pH, time and volume of Sulphuric added at each intermediary step
- Measure Alkalinity once target pH is reached
- Remove sample from jar stirrer and leave to sit on bench.

- Measure pH and Alkalinity after 24 hrs
- Repeat titration to pH 5.0 as per above.

2.2 Results

Figures 3 and 4 show CO₂ dosed supernatant with pH measured over time to determine the amount of degassing expected if CO₂ was used to trim pH of WTP supernatant on site.

Figure 3 pH Adjustment of Supernatant using CO₂ (60mins rest, no stir)

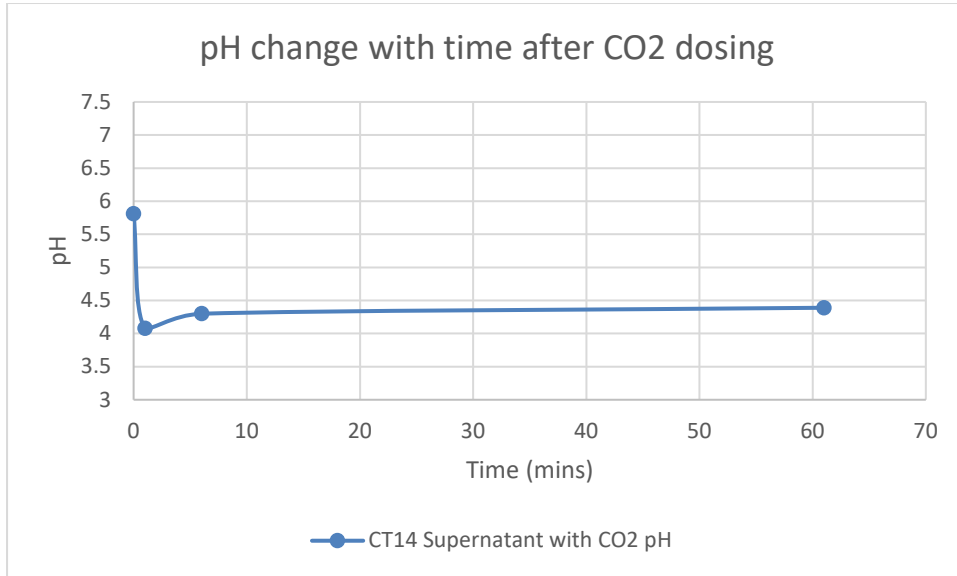
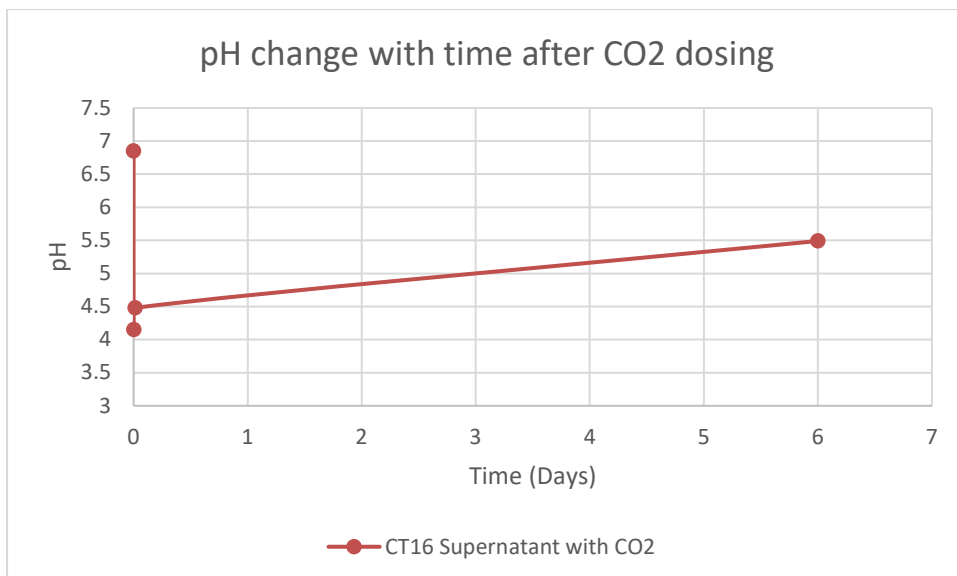


Figure 4 pH Adjustment of Supernatant using CO₂ (20mins stir, 6 days rest)



After dosing with CO₂, the pH rose slightly after 5-60 mins of resting only (Initial pH of 4.08 rose to pH 4.3 then pH 4.39).

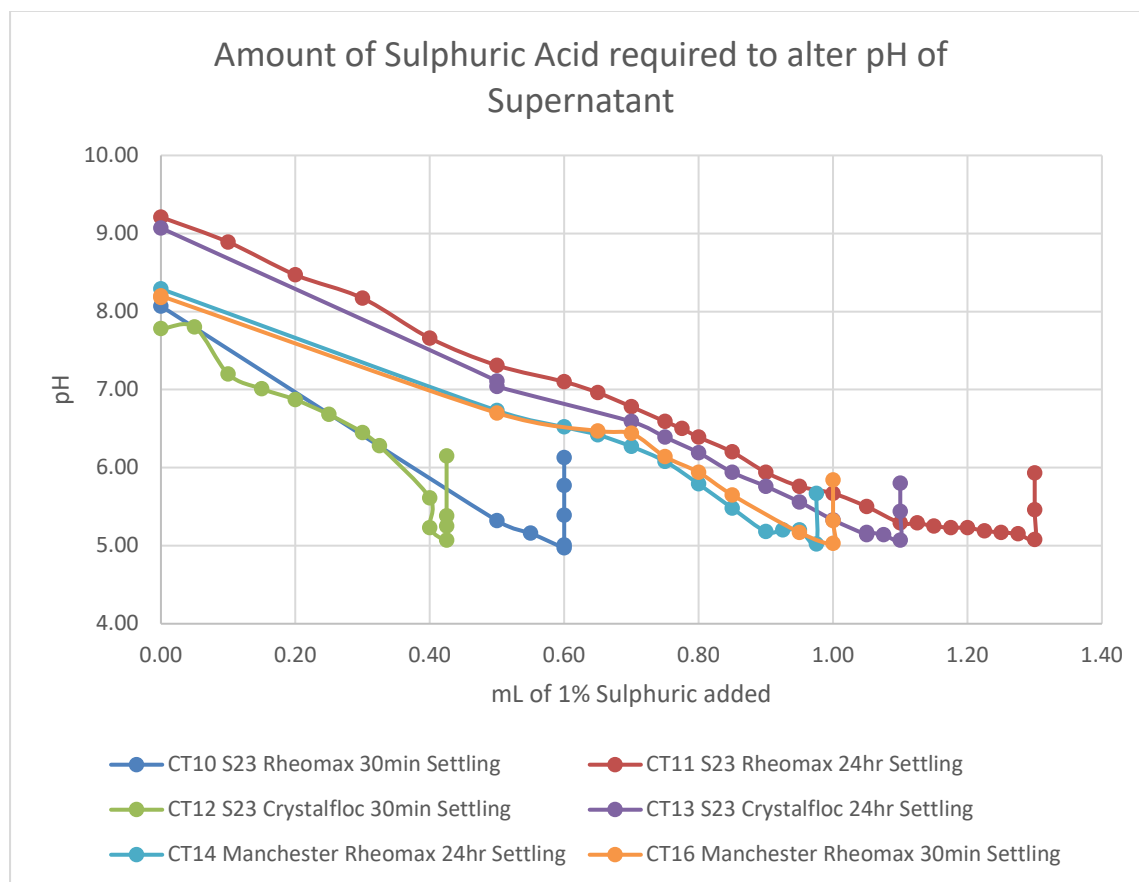
Slow stirring for 20 mins also resulted in a slight pH rise (pH 4.15 – pH 4.48). Further rise in pH was measured after 6 days of resting (pH 4.48–pH 5.49).

This suggests that should CO₂ be used for pH adjustment, some pH rise can be expected due to degassing.

On site, in a WTP Carbon dioxide design would be done under pressure in piping, and there would be better control to ensure the gas was in solution. However, once that water is released to the environment in a drain or open channel, turbulence would potentially cause aeration and pH rise as the Carbon Dioxide comes out of solution.

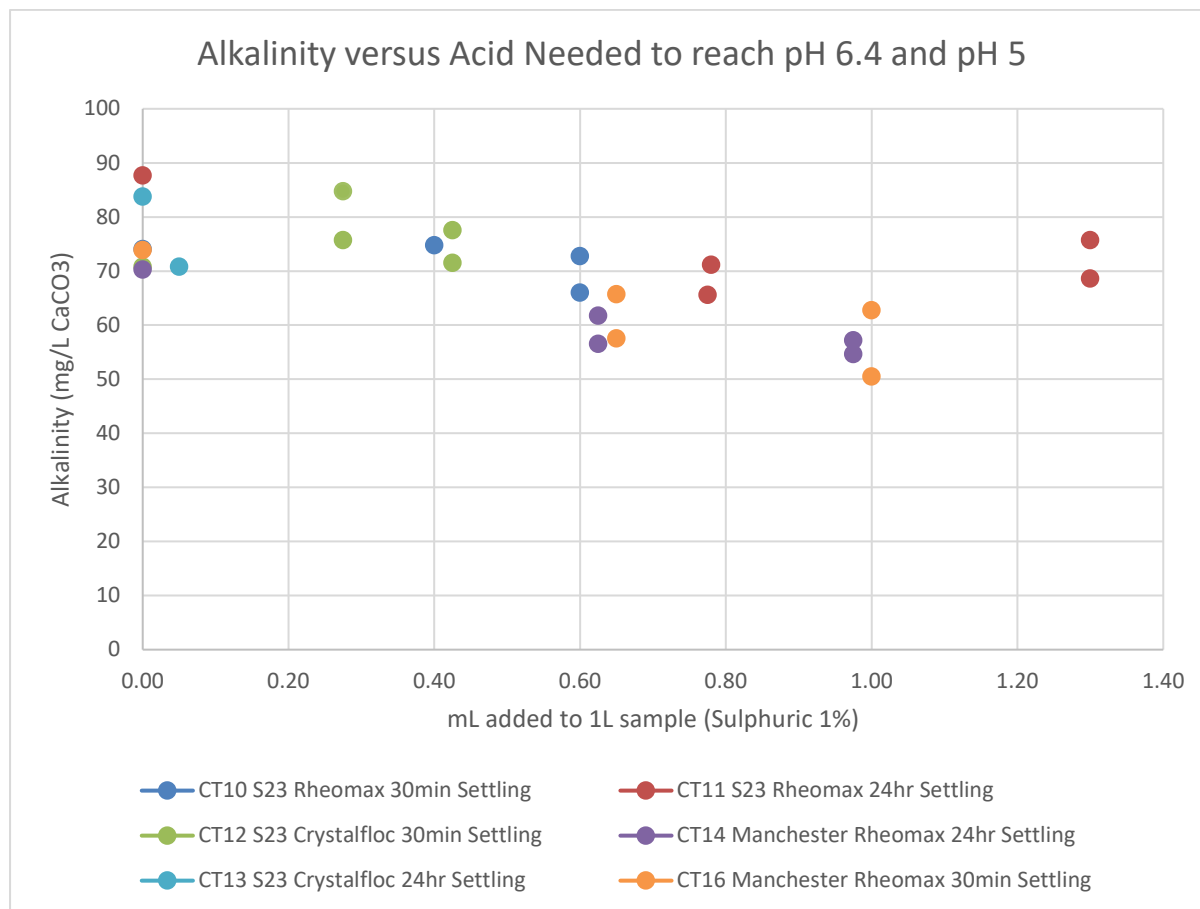
Figure 5 shows Sulphuric Acid dosed at different rates (6 different supernatant samples) with pH measured.

Figure 5 Amount of Sulphuric Acid required to alter pH of AMD Supernatant



The pH adjustment with Sulphuric acid after pH reduction, then showed some pH raise or rebound over time, which is represented by the vertical range of pH's for a set Sulphuric dose in Figure 5. The samples were measured for up to 24 hours after pH adjustment and all samples did show a pH rise over this time.

Figure 6 Alkalinity for Supernatants adjusted with Sulphuric Acid



Overall none of the results showed alkalinity below 50mg/L with the acid doses in the above graph. For pH adjustment of post treatment supernatant to be within the process pH range of 5.5-6.5pH, dosing of between 0.4mL/L – 1.3 mL/L of 1% Sulphuric Acid would be needed (this is a dose of 4-13mg/L Sulphuric Acid). This dose reduced alkalinity slightly from the range of around 90-70 mg/L to minimum of 50 mg/L Alkalinity.

2.3 Conclusions

Both methods of pH adjustment (Carbon Dioxide and Sulphuric Acid) have provided adequate pH adjustment to the range required to meet the pH Target range of 4.5-7pH.

Both methods had some pH rise over time after dosing.

Alkalinity was reduced using Sulphuric acid, but of all the tests trialled, none had an alkalinity less than 50 mg/l.

Both Carbon Dioxide and Sulphuric acid are widely used in water treatment and industry and their dosing technologies are proven and will provide effective control.

Practical on-site considerations of the logistics of getting Carbon Dioxide Gas delivered to site versus Sulphuric Acid (which is already used on site) may be more of a factor in the final decision about how to adjust post-treatment pH.

APPENDIX A – CHEMICAL AND NEUTRALISING AGENT DATA

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-24-NW-046418-01	REPORT DATE	05/08/2024
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[REDACTED]		[REDACTED]	
[REDACTED]		[REDACTED]	
[REDACTED]		[REDACTED]	
[REDACTED]		[REDACTED]	
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[REDACTED]		[REDACTED]	
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[REDACTED]		[REDACTED]	

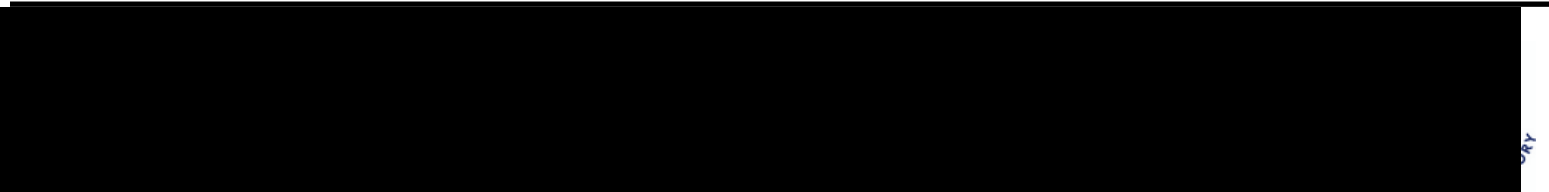
Contact for your orders:	[REDACTED]	Order code:	EUNZWE-00196988
Contract:	Contract for Graymont (NZ) Limited	Purchase Order Number:	1017166
Submission Reference:	Mak Oxd		

SAMPLE CODE	812-2024-00109651		
Sample Name	Makareao Oxide 13-17/7		
Sample Reference	Makareao Oxide		
Reception Date & Time:	02/08/2024 9:30		
Analysis Started on:	03/08/2024	Analysis Ending Date:	05/08/2024
Product Type	Quicklime	Sampled Date & Time	30/07/2024 00:00
Sampler(s)	CUSTOMER		

RESULTS			LOQ
NW499	Arsenic - Total		
	Arsenic (As)	0.34	mg/kg
			0.05
NW504	Cadmium - Total		
	Cadmium (Cd)	0.64	mg/kg
			0.01
NW507	Chromium - Total		
	Chromium (Cr)	8.8	mg/kg
			0.2
NW509	Copper - Total		
	Copper (Cu)	1.3	mg/kg
			0.3
NW511	Lead - Total		
	Lead (Pb)	0.5	mg/kg
			0.1
NW515	Mercury - Total		
	Mercury (Hg)	<0.1	mg/kg
			0.1
NW517	Nickel - Total		
	Nickel (Ni)	1.2	mg/kg
			0.2

LIST OF METHODS			
NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature



Food & Water Testing

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received. Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

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Eurofins General Terms and Conditions apply.

END OF REPORT

SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
 Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
 Restriction of Use in NZ: Refer to Section 15

New Zealand Supplier:
 Address:

Telephone:

Emergency No:
Website:

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: MAGNESIUM OXIDE 87%

Recommended Use of the Chemical and Restrictions on Use

Supplier:

NZBN:

Street Address:

Telephone Number:

Facsimile:

Emergency Telephone:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Magnesium oxide	1309-48-4	$\geq 87\%$	-
Other component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, remove contaminated clothing and wash skin and hair with soap and water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Ingestion:

Rinse mouth with water. If swallowed, do NOT induce vomiting. Seek medical advice.

Safety Data Sheet



Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Extinguishing media appropriate to surrounding fire conditions.

Specific hazards arising from the chemical:

Non-combustible material.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact. Avoid breathing in dust. Work up wind or increase ventilation. Sweep or vacuum up, but avoid generating dust. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Protect from moisture. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Safety Data Sheet



Appropriate engineering controls:

Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder
Colour:	White, Off-white or Brown
Odour:	Odourless
Odour Threshold:	Not available
Solubility:	Insoluble in water.
Specific Gravity:	Not available
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	2600
Decomposition Point (°C):	Not available
pH:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with incompatible materials shown below.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Hazardous polymerisation will not occur.

Safety Data Sheet



Conditions to avoid:	Avoid dust generation. Avoid exposure to moisture.
Incompatible materials:	Incompatible with interhalogens , phosphorous pentachloride .
Hazardous decomposition products:	None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	No adverse effects expected, however, large amounts may cause nausea and vomiting.
Eye contact:	May be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Contact with skin may result in irritation.
Inhalation:	Breathing in dust may result in respiratory irritation.
Acute toxicity:	No LD50 data available for the product.
Respiratory or skin sensitisation:	No information available.
Chronic effects:	No information available for the product.
Aspiration hazard:	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
Persistence/degradability:	No information available.
Bioaccumulative potential:	No information available.
Mobility in soil:	No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Safety Data Sheet



Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; not dated.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

First Issue Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/7

BASF Safety data sheet
Date / Revised: 21.04.2011
Product: **RHEOMAX® 1030**

Version: 1.0

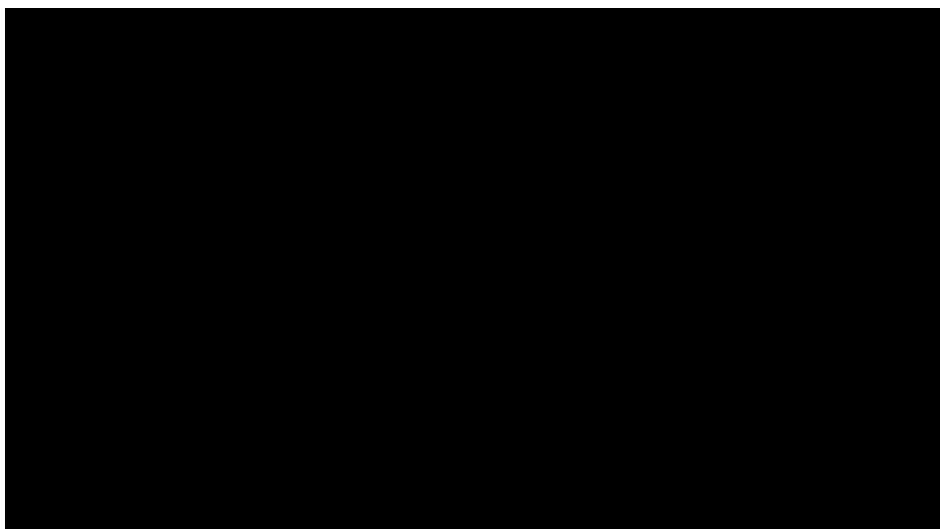
(30483654/SDS_GEN_AU/EN)

Date of print 22.04.2011

1. Substance/preparation and company identification

RHEOMAX® 1030

Use: Rheology modifier



2. Hazard identification

- ❖ **Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

polyacrylamide, anionic

4. First-Aid Measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
Wash thoroughly with soap and water.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:
Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Note to physician:
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Specific hazards:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions:

Use personal protective clothing.

Environmental precautions:

Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

7. Handling and Storage

Handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Storage

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

8. Exposure controls and personal protection

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 3 mg/m³ (ACGIHTLV), Respirable particles

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (ACGIHTLV), Inhalable particles

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields.

Body protection:

light protective clothing

General safety and hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Form: powder
Colour: off-white
Odour: odourless

pH value: 6 - 8
(10 g/l)
The product has not been tested. The statement has been derived from products of a similar structure or composition.

Melting point:

The substance / product decomposes therefore not determined.

Flash point:

not applicable

Flammability: not highly flammable

Self ignition: not self-igniting

Fire promoting properties: not fire-propagating

Bulk density: approx. 750 kg/m³
Solubility in water: Forms a viscous solution.

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:

Avoid extreme temperatures. Avoid humidity.

Substances to avoid:

strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

LD₅₀ rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Primary skin irritation rabbit: non-irritant (OECD Guideline 404)

Primary irritations of the mucous membrane rabbit: non-irritant

Sensitization

Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, *Daphnia magna*

Mobility

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulation potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Dispose of in accordance with national, state and local regulations.

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information**Domestic transport:**

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

Registration status:

AICS, AU released / listed

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

For further information contact www.epa.govt.co.nz or the New Zealand Supplier

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Emergency telephone number

International emergency number:

Telephone: +49 180 2273-112

2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation.

Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form: powder

Colour: off-white

Odour: odourless

Melting point:

The substance / product decomposes
therefore not determined.

Flash point:

not applicable

Solubility in water: Forms a viscous solution.

Fire promoting properties: not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals: No corrosive effect on metal.

Formation of Start temperature: 220 °C

flammable gases:

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: [REDACTED]

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

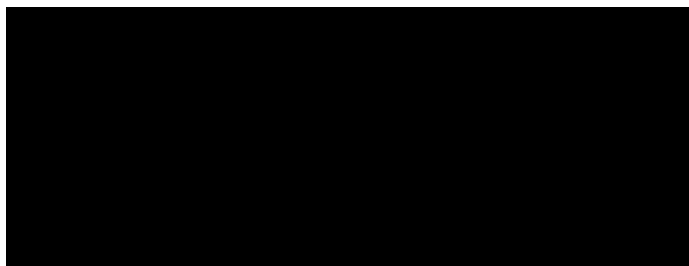
Product Name: CRYSTALFLOC B600 SERIES

Other name(s): Crystalfloc grades: B610, B610H, B620, B630 KOS, B630L, B630 LVM, B630H, B640H, B660, B660H, B660 LVM, B670, B680H, B680 LVM, B600 PWG, B680 LVM-S, B690, B630KPWG, B640, B680PWG, Crystalfloc Anionic Powder.

Recommended Use of the Chemical and Restrictions on Use Flocculant/coagulant for water and waste water treatment.

Supplier:
NZBN:
Street Address:

Telephone Number:
Facsimile:
Emergency Telephone:



Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Product Description: Anionic water-soluble polymer.

Components	CAS Number	Proportion	Hazard Codes
Non hazardous component(s)	-	100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:

If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet

**Ingestion:**

Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Combustible solid. On burning will emit toxic fumes, including those of oxides of carbon, and oxides of nitrogen. Product is extremely slippery when wet.

Special protective equipment and precautions for fire-fighters:

Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Avoid skin and eye contact. Avoid breathing in dust. Wear protective equipment to prevent skin and eye contact and inhalation of vapours/dusts.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Wet material is slippery when spilt. DO NOT spray with water. Sweep up, but avoid generating dust. Collect in properly labelled containers for disposal. After cleaning, flush away any residual traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in dust. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for particulates:

Particulates not otherwise classified: 8hr WES-TWA 10 mg/m³ (inhalable dust) or 3 mg/m³ (respirable dust)

Safety Data Sheet



As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Wear overalls, safety glasses and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Granular Solid
Colour:	White
Odour:	Odourless or Slight Odour
Solubility:	Miscible with water.
Specific Gravity:	ca. 0.6-0.9 (Bulk density)
Flash Point (°C):	Not available
Flammability Limits (%):	Not available
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	>150
Decomposition Point (°C):	>150
pH:	5-9 @5 g/L

10. STABILITY AND REACTIVITY

Product Name: CRYSTALFLOC B600 SERIES
Substance No: 000000015935

Issued: 20/09/2019
Version: 9

Safety Data Sheet



Reactivity:	Oxidizing agents may cause vigorous reactions.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Dust explosion hazard. Hazardous polymerisation will not occur.
Conditions to avoid:	Avoid dust generation. Avoid contact with water. Wet product renders surfaces extremely slippery.
Incompatible materials:	Incompatible with oxidising agents.
Hazardous decomposition products:	Oxides of carbon. Oxides of nitrogen. Hydrogen cyanide.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	Not expected to be an eye irritant. Exposure to the dust may cause discomfort due to particulate nature. May cause physical irritation to the eyes.
Skin contact:	Not expected to be a skin irritant.
Inhalation:	Material may be irritant to the mucous membranes of the respiratory tract (airways).

Acute toxicity:

Oral LD50 (rat): >5000 mg/kg

Dermal LD50 (rat): >5000 mg/kg

Skin corrosion/irritation:	Non-irritant.
Serious eye damage/irritation:	Non-irritant.
Respiratory or skin sensitisation:	Not a skin sensitiser (guinea pig).

Chronic effects:

Mutagenicity:	Not classified.
Carcinogenicity:	Not classified.
Reproductive toxicity:	Not classified.
Specific Target Organ Toxicity (STOT) - single exposure:	Not classified.
Specific Target Organ Toxicity (STOT) - repeated exposure:	Not classified.
Aspiration hazard:	Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity	Avoid contaminating waterways.
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Safety Data Sheet



Persistence/degradability: Not readily biodegradable.

Bioaccumulative potential: Does not bioaccumulate.

Mobility in soil: No information available.

Log Octanol/Water Partition
Coefficient: -2

48hr LC50 (Daphnia magna): >100 mg/L

96hr LC50 (fathead minnow): >100 mg/L

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

16. OTHER INFORMATION

Supplier Safety Data Sheet; 06/ 2019.

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:

5 Yearly Revised Primary SDS

Safety Data Sheet



This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET



Revision date: 27-Apr-2022

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name MAGNESIUM OXIDE

Product Code(s) 000030125401

Other means of identification

CAS No. 1309-48-4

Synonyms Emag 45.

Recommended use of the chemical and restrictions on use

Recommended use Chemical manufacturing, pulp and paper.

Uses advised against No information available.

Details of the supplier of the safety data sheet

Supplier

Ixom Operations Pty Ltd (Incorporated in Australia)
NZBN: 9429041465226 Address: 166 Totara Street
Mt Maunganui South
New Zealand

Telephone Number: +64 9 368 2700

Facimile: +64 9 368 2710

For further information, please contact

Contact Point Product Safety Department

Emergency telephone number

Emergency Telephone 0 800 734 607 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

Based on available information, not classified as hazardous according to criteria in the Hazardous Substances (Hazard Classification) Notice 2020.

GHS Classification

Label elements

Hazard statements

Other hazards which do not result in classification

May be harmful if swallowed

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Weight-%
Magnesium oxide	1309-48-4	>90
Amorphous silica	112945-52-5	<5
Magnesium hydroxide	1309-42-8	<3
Calcium oxide	1305-78-8	<1
Crystalline silica (Quartz)	14808-60-7	<1 (non respirable)

4. FIRST AID MEASURES**Description of first aid measures**

General advice For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number

Inhalation Remove to fresh air. Call a physician if symptoms occur.

Eye contact In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if symptoms occur.

Skin contact Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion Rinse mouth thoroughly with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE FIGHTING MEASURES**Suitable Extinguishing Media**

Suitable Extinguishing Media Use extinguishing agent suitable for type of surrounding fire.

Unsuitable extinguishing media No information available.

Specific hazards arising from the chemical

Specific hazards arising from the chemical Non-combustible.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Use personal protective equipment as required. Wash thoroughly after handling.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Use appropriate personal protective equipment (PPE). Carefully shovel or sweep up spilled material and place in suitable container. Avoid generating dust.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid generation of dust. Use personal protection equipment. Wash thoroughly after handling.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep in a dry, cool and well-ventilated place. Protect from direct sunlight. Protect from moisture. Keep container closed when not in use.

Incompatible materials Interhalogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Magnesium oxide fume: 8hr WES-TWA = 10 mg/m³

Silica-Amorphous (Precipitated silica): WES-TWA 10 mg/m³

Calcium oxide: WES-TWA 2 mg/m³

Silica-Crystalline α-Quartz: WES-TWA = 0.05 mg/m³ (respirable dust), confirmed carcinogen

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Apply technical measures to comply with the occupational exposure limits.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection

Glasses.

Hand protection

Impervious gloves.

Skin and body protection

Protective shoes or boots. Overalls.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	No information available.
Color	White to Pink
Odor	Slight
Odor threshold	No information available.

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	Not applicable	None known
Melting point / freezing point	2600-2800°C	None known
Boiling point / boiling range	3600°C	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	>1.0	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information**10. STABILITY AND REACTIVITY**Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Hazardous polymerization Hazardous polymerization does not occur.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid Dust formation. Direct sunlight. Moisture. Avoid contact with water.

Incompatible materials

Incompatible materials Interhalogens.

Hazardous decomposition products

Hazardous decomposition products None known based on information supplied.

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Information on likely routes of exposure**

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation.

Eye contact Dust contact with the eyes can lead to mechanical irritation.

Skin contact May cause irritation.

Ingestion May cause gastrointestinal discomfort if consumed in large amounts.

Symptoms No information available.

Acute toxicity**Numerical measures of toxicity**

Refer to component information below.

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Magnesium oxide	= 3990 mg/kg (Rat) = 3870 mg/kg (Rat)	-	-
Amorphous silica	= 3160 mg/kg (Rat)	-	-
Magnesium hydroxide	= 8500 mg/kg (Rat)	-	-
Calcium oxide	= 500 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Refer to 'Chronic effects' section below.

Chemical name	New Zealand	IARC
Amorphous silica - 112945-52-5		Group 3
Crystalline silica (Quartz) - 14808-60-7	Confirmed carcinogen	Group 1

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

Reproductive toxicity No information available.

STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.
Chronic effects:	Repeated exposure by inhalation to high levels of amorphous silica may cause pneumoconiosis but there is no adequate epidemiological data available to evaluate the carcinogenicity of amorphous silica. Amorphous silica has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. For crystalline silica (inhaled in the form of respirable quartz or cristobalite from occupational sources): This material has been classified by the International Agency for Research on Cancer (IARC) as a Group 1 agent. Group 1 - the agent is carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity	Keep out of waterways.
Terrestrial ecotoxicity	There is no data for this product.

Chemical name	Algae/aquatic plants	Fish	Crustacea
Magnesium hydroxide	-	LC50: =511.31mg/L (96h, Pimephales promelas)	-
Calcium oxide	-	LC50: =1070mg/L (96h, Cyprinus carpio)	-

Persistence and degradability

Persistence and degradability	No information available.
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Bioaccumulative potential

Bioaccumulation	No information available.
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Mobility

Mobility in soil	No information available.
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Other adverse effects

Other adverse effects	No information available.
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13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with federal, state and local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

ROAD AND RAIL TRANSPORT

Not classified as a Dangerous Good under NZS 5433 Transport of Dangerous Goods on Land; NON-DANGEROUS GOODS.

IATA

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

IMDG

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

New Zealand

National regulations

See section 8 for national exposure control parameters

International Inventories

NZIoC

All the constituents of this material are listed on the New Zealand Inventory of Chemicals.

TSCA

Contact supplier for inventory compliance status.

DSL/NDSL

Contact supplier for inventory compliance status.

EINECS/ELINCS

Contact supplier for inventory compliance status.

ENCS

Contact supplier for inventory compliance status.

IECSC

Contact supplier for inventory compliance status.

KECL

Contact supplier for inventory compliance status.

PICCS

Contact supplier for inventory compliance status.

AIIC

All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:

NZIoC - New Zealand Inventory of Chemicals

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances

IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

AIIC - Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Supplier Safety Data Sheet 02/ 2022

Prepared By This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Issuing Date: 27-Apr-2022

Reason(s) For Issue: Revised Primary SDS

Revision Note:

The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

Agency for Toxic Substances and Disease Registry (ATSDR)
U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet



1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **SUPERFLOC B SERIES**

Other name(s): Superfloc BX, Superfloc 20

Recommended Use of the Chemical and Restrictions on Use Water treatment flocculant.

Supplier:

NZBN:

Street Address:

Telephone Number:

Facsimile:

Emergency Telephone:

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

SIGNAL WORD: WARNING

Subclasses:

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684



Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

Precautionary Statement(s):

Prevention:

P102 Keep out of reach of children.

P264 Wash hands thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Safety Data Sheet

**Response:**

P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P330 Rinse mouth.

P302+P352 IF ON SKIN: Wash with plenty of soap and water.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing before re-use.

P321 Specific treatment (see First Aid Measures on the Safety Data Sheet).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 If eye irritation persists: Get medical advice/attention.

Storage:

No storage statements.

Disposal:

P501 In case of a substance that is in compliance with a HSNO approval other than a Part 6A (Group Standards) approval, a label must provide a description of one or more appropriate and achievable methods for the disposal of a substance in accordance with the Hazardous Substances (Disposal) Notice 2017. This may also include any method of disposal that must be avoided.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Polyaluminium chloride	1327-41-9	30-35%	H302 H315 H319
Non hazardous component(s)	-	to 100%	-

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:

Remove victim from area of exposure - avoid becoming a casualty. Seek medical advice if effects persist.

Skin Contact:

If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:

If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:

Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:

Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:

Not combustible, however, if material is involved in a fire use: Fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Specific hazards arising from the chemical:

Non-combustible material.

Product Name: SUPERFLOC B SERIES

Substance No: 000000016077

Issued: 17/04/2018

Version: 6

Safety Data Sheet



Special protective equipment and precautions for fire-fighters:

Decomposes on heating emitting toxic fumes, including those of hydrogen chloride . Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:

Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:

Slippery when spilt. Avoid accidents, clean up immediately. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Neutralise residues with lime or soda ash. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid skin and eye contact and breathing in vapour, mists and aerosols. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities: Store in a cool, dry, well ventilated place. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Workplace Exposure Standards: No value assigned for this specific material by the New Zealand Workplace Health & Safety Authority. However, Workplace Exposure Standard(s) for constituent(s):

Aluminium, as Al: Soluble salts WES-TWA 5 mg/m³

As published by the New Zealand Workplace Health & Safety Authority.

WES - TWA (Workplace Exposure Standard - Time Weighted Average) - The eight-hour, time-weighted average exposure standard is designed to protect the worker from the effects of long-term exposure.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:

Natural ventilation should be adequate under normal use conditions. Ensure ventilation is adequate and that air concentrations of components are controlled below quoted Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Safety Data Sheet



Individual protection measures, such as Personal Protective Equipment (PPE):

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Wear overalls, chemical goggles and impervious gloves. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. If determined by a risk assessment an inhalation risk exists, wear a suitable mist respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Amber
Odour:	Not specified
Solubility:	Miscible in water.
Specific Gravity:	1.20 @20°C
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not applicable
Flammability Limits (%):	Not applicable
Autoignition Temperature (°C):	Not applicable
Boiling Point/Range (°C):	ca. 100
pH:	2.7

10. STABILITY AND REACTIVITY

Reactivity:	No information available.
Chemical stability:	This material is considered stable.
Possibility of hazardous reactions:	None known.
Conditions to avoid:	None known.
Incompatible materials:	Incompatible with acids , alkalis , calcium hypochlorite .
Hazardous decomposition products:	Hydrogen chloride.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Safety Data Sheet



Ingestion: Swallowing can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation.

Eye contact: An eye irritant.

Skin contact: Contact with skin will result in irritation.

Inhalation: Breathing in mists or aerosols may produce respiratory irritation.

Acute toxicity: No LD50 data available for the product. However, for constituent(s) POLYALUMINIUM CHLORIDE:
Oral LD50 (rat): 681 mg/kg.
Oral LD50 (mice): 316 mg/kg.

Respiratory or skin sensitisation: No information available.

Chronic effects: No information available for the product.

Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

13. DISPOSAL CONSIDERATIONS

Disposal methods:

Refer to local government authority for disposal recommendations. Dispose of contents/container in accordance with local/regional/national/international regulations. Normally suitable for disposal at approved land waste site.

14. TRANSPORT INFORMATION

Road and Rail Transport

Not classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land.

Marine Transport

Not classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; NON-DANGEROUS GOODS.

Air Transport

Not classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; NON-DANGEROUS GOODS.

15. REGULATORY INFORMATION

Classification:

Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Notice 2017 and the Hazardous Substances (Classification) Notice 2017.

Product Name: SUPERFLOC B SERIES
Substance No: 000000016077

Issued: 17/04/2018
Version: 6

Safety Data Sheet

**Subclasses:**

Subclass 6.1 Category D - Substances which are acutely toxic.

Subclass 6.3 Category A - Substances that are irritating to the skin.

Subclass 6.4 Category A - Substances that are irritating to the eye.

Water Treatment Chemicals (Subsidiary Hazard) Group Standard 2017

Approval Number: HSR002684

Hazard Statement(s):

H302 Harmful if swallowed.

H315 Causes skin irritation.

H319 Causes serious eye irritation.

16. OTHER INFORMATION

'Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinnati, 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:

5 Yearly Revised Primary SDS

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Company:

Telephone:

Telefax:

E-mail address:

1.4. Emergency telephone number

24-hour emergency number:

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Active Water Treatment Testing Report

Appendix K – Reference Documentation

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	26/03/2026
Document Number:	PFL-2408-PRO-RPT-00012

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated following client comments			G Smith	26/03/2026

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1 REFERENCE DOCUMENTATION

The following documents were referenced during the test work. Copies of these can be provided on request.

- Hickey, C, 2026, Guidelines Summary Table v4 190326, Document
- Hickey, C, 2026, Guideline Summary Equations, v5 190326, Spreadsheet
- Minewater Hydrology, Pollution, Remediation, Paul L. Younger, Stephen A Banwart, and Robert S Hedin 2002, p292
- The formation of high-density sludge from mine water with low iron concentrations, Coulton, R., Bullen, C., Williams, C. and Williams, K., Unipure Europe Ltd and University of Cardiff.
- Bench Scale Comparison of conventional and high-rate clarification treatment processes for acid mine drainage, Mackie, A.L and Walsh M. E., Water Quality Research Journal of Canada 50.3, (2015), p283.
- Development of a laboratory procedure to determine dry matter in maize forage R.J. Hill and S. Ballinger, Agronomy N.Z 34 2004 pp109-115).
- <https://www.landcareresearch.co.nz/partner-with-us/laboratories-and-diagnostics/environmental-chemistry-laboratory/soil-testing/#s105>
Test Method no. 104(ii) Water Content
Rayment, G.E. and Lyons, D.J. 2011. Soil Chemical Methods – Australasia.
- Standard Methods for the Examination of Water and Wastewater 24th Edition, American Public Health Association, Lipps, W. C., Braun-Howland, E. B., and Baxter, T.E., Method 2540 Total Solids Dried from 103 to 105°C.
- Bench Scale and Column Scale Water Treatment Testing Report
For Concept Design of Active Water Treatment Plants
(PFL-2408-PRJ-RPT-000002 - Water Testing Report RevA.pdf)
Issued 23/09/2024
- MEMO - Bench Scale Water Treatment Testing Report MSR Effluent Testing October 2024
For Concept Design of Active Water Treatment Plants
(PFL-2408-PRJ-RPT-000003 - MEMO MSR.pdf)
Issued 6/11/2024
- DRAFT MEMO – BVMSR Bench Scale Water Treatment Testing Report BVMSR Effluent Testing December 2024 and February 2025
For Concept Design of Active Water Treatment Plants
(PFL-2408-PRJ-RPT-000004 RevC - Memo BVMSR 25 testing.pdf)
Issued 12/02/2025

- Four Verum reports
 - Verum Report – BT Mining neutralising Agent Comparison V1 [undated report but circa July 2023]
 - Verum Report CaO MgO neutralisation comparison Round Two – 24 – 000653.pdf November 2023
 - Verum CaO MgO Comparison Round 3: Preliminary Results 19/03/2024
 - Verum Report CaO MgO neutralisation comparison Round Three – 24 – 000786.pdf May 2024
- Laboratory Testing for Sludge Dewatering with Belt Filter Presses - Reference video from University of Texas El Paso College of Engineering/El Paso Water Utilities Public Service Board.
<https://youtu.be/yS4odlYLshk>

Active Water Treatment Testing Report

Appendix L – General Test Methodologies

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	28/11/2025
Document Number:	PFL-2408-PRO-RPT-00013

Revision Control

Revision	Status	Description	Author	Checked	Approved	Date
A	Review	Issued for Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	16/05/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025

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1 GENERAL TEST METHODOLOGIES

This section describes the general methods used for the AMD bench and column scale water treatment testing. Where the tests are specific to a subject area section of the report, these are described in detail specifically to each section.

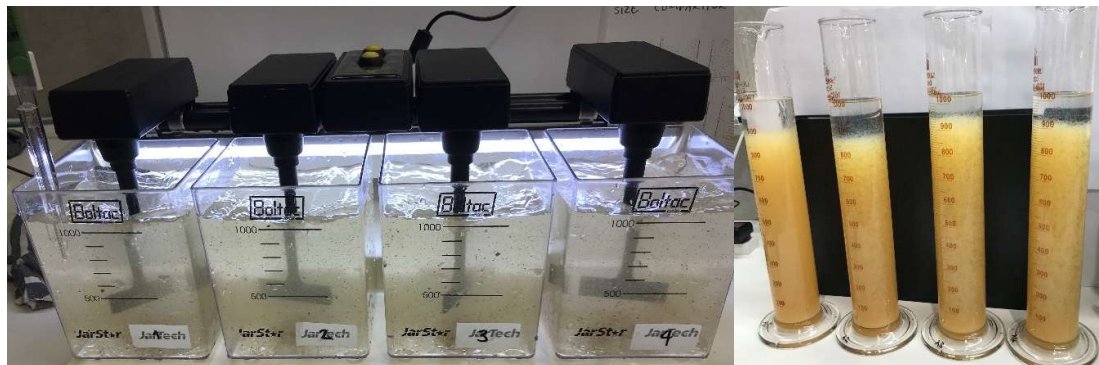
1.1 Bench Scale Process Testing Method

The following describes the detailed test method used for the bench tests discussed in this report, outlining the process stages in the bench mixing and settlement phases.

1.1.1 Bench Testing Equipment:

- A Boltac Infinity Jar Stirrer and four 1 litres jars were used for rapid and slow mixing process phases.
- Four x 1 litre glass graduated cylinders were used for bench settling tests.
- Hach DR3900 Spectrophotometer was used for dissolved metals, alkalinity and hardness testing.
- Realtech UVT meter used for UVT254 measurement
- Hanna Handheld Turbidimeter used for Turbidity measurement
- Hanna Bench top pH Meter for pH measurement

Figure 1 The Boltac Infinity jar test mixing unit and Settling Cylinders



1.1.2 Sample handling

IBCs of each water sample (Manchester St, S23 and Barren Valley ELF) were collected and stored in darkness at Process Flow in Richmond until testing commenced. This was to prevent temperature changes and light influence on the water prior to testing.

Preparation of the raw test water, to get a representative sample and to prevent stratification in the IBCs, included mixing at the time of sampling and sampling equally from both IBCs. All jars were triple rinsed with sample water prior to test water filling.

1.1.3 Contamination prevention

To prevent metals contamination between tests, after testing each run, the jars and cylinders were cleaned with Pyroneg detergent and rinsed with deionised water.

1.1.4 Neutralisation

Neutralisation chemicals Calcium oxide and Magnesium oxide were used for the bench jar testing (Magnesium oxide in the MgO testing Section **Error! Reference source not found.** only). CaO was used in column scale and barrel scale testing, the products used in testing are below:

- Graymont High Calcium Quicklime (mixed as 20% slurry in deionised water)
- Emag45 (mixed as a 10% slurry in deionised water) in the MgO testing Section **Error! Reference source not found.**
- Farmguard MgO (mixed as 10% slurry in deionised water) in the MgO testing Section **Error! Reference source not found.**

Test purity specifications and material safety data sheets are included in Appendix E Neutralising Agent Data of the treatment report **PFL-2408-PRO-RPT-00002 – Appendix A - Bench and Column Water Treatment Tests_Rev0.**

Neutralisation was initially set to 350rpm to speed up the pH change process. Initial Neutralisation tests were trialled at up to 1 hour (in report PFL-2408-PRJ-RPT-000002), but 20 minutes was found to be the optimum time with 350rpm rapid mix speed, with only slight pH change still occurring after 20 minutes.

The process used for all the subsequent neutralisation phase testing as 20 minutes rapid mix at 350rpm (Mixer Velocity Gradient G value 450 s^{-1} (r.m.s. root mean square velocity gradient)).

Measurement of pH was taken at 1, 5, 10, 15, 20 minutes during rapid mix to monitor the neutralisation phase.

1.1.5 Coagulant/Metal Chelation Agent addition

The coagulant/chelating agent products used in testing were:

- Metalsorb FZ (mixed as a 0.1% solution with deionised water)
- SuperflocBX5 (mixed as a 1.0% solution with deionised water)

After neutralisation, Coagulant addition was at the start of a 350 rpm Rapid Mixing phase for 1 minute.

1.1.6 Flocculant addition

The coagulant/chelating agent products used in testing were:

- Rheomax1050 (mixed as a 0.1% solution with deionised water)
- Crystalfloc610H (mixed as a 0.1% solution with deionised water)

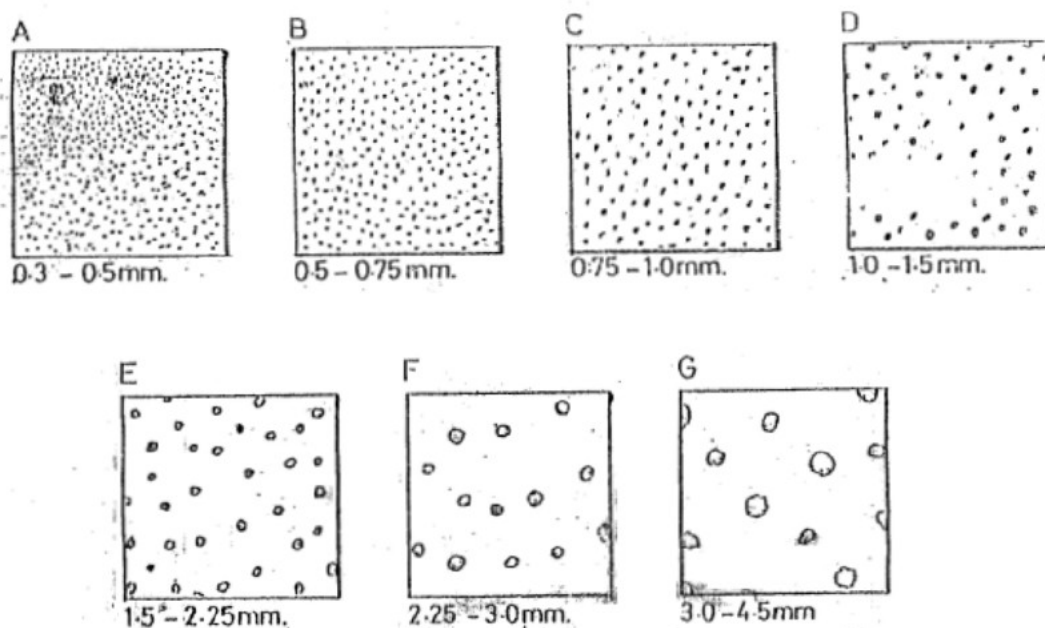
After coagulation rapid mix, Flocculant addition was during a 350 rpm Rapid Mixing phased for 1 minute.

1.1.7 Floc Formation

After flocculant addition and rapid mix, Slow mix then commenced at mixer speed 30rpm, (Mixer Velocity Gradient G value 15 s^{-1}), with a slow mix phase lasting 10 minutes.

Floc sized was noted at the start and end of the slow mix phase. Change in pH during slow mix was measured at 5 and 10 minutes.

Figure 2 Floc Size Comparator

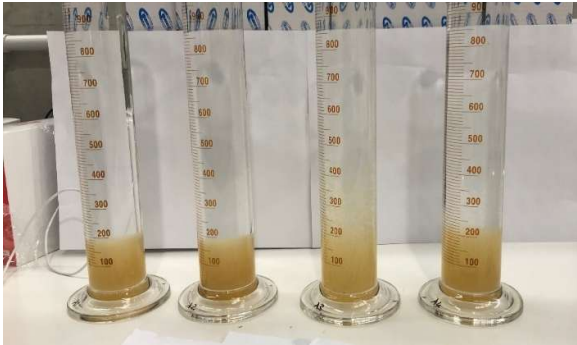


1.1.8 Settling Phase

The flocculated test waters were transferred from the 1 litre mixing jars to the settling cylinders and allowed to settle for 30 minutes, noting settled distance over time.

After settling, the Supernatant was transferred into another vessel for further testing.

Table 1 Bench Scale Settling Cylinders



1.2 Column Settling Testing Method

Settling Column Testing was performed to scale up the bench testing to replicate and/or improve on the Jar Scale tests. The volume scale up was 56 times the jar testing volume. 56L of sample water was used in the column tests. The columns were 2m tall and 200mm diameter with sample points at the following heights above base: 25mm, 245mm (P3), 500mm, 755mm, 995mm (P2), 1245mm, 1500mm, 1750mm (P1). Three Perspex settling columns were set up and a 200L plastic mixing barrel with stainless steel stirrer was used to blend the reagents.

Figure 3 Settling Columns



1.2.1 Rapid and Slow Mix

The Rapid mix speed was performed at 300 rpm using a calibrated drill press and the slow mix was performed at 30 rpm manually.

As per the bench scale testing rapid mix of 20 minutes was used for neutralisation, 1 minute for coagulant addition and 1 minute for flocculant addition.

During slow mix, most tests had 10 minutes duration, but for some tests the floc formed rapidly in the mixing drum so the slow mix time was reduced or in some cases the sample was transferred immediately to the column, eliminating the slow mix phase (Column Tests T3 - 5 mins slow mix and T7, T8, T9 had no slow mix).

Figure 4 Barrel Mixer Rapid Mix

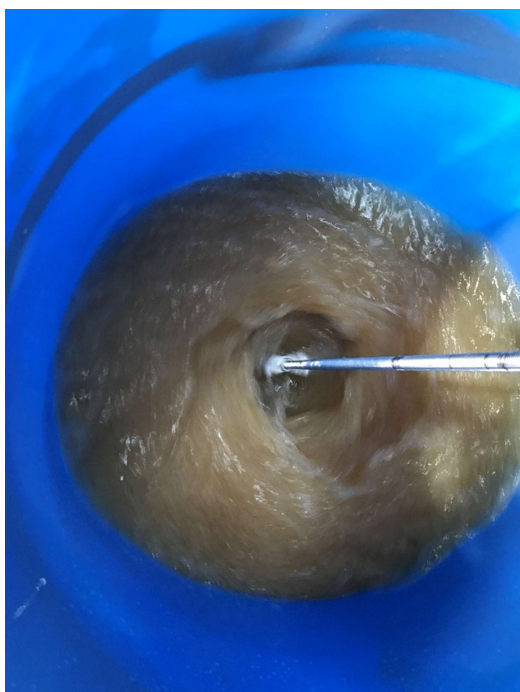
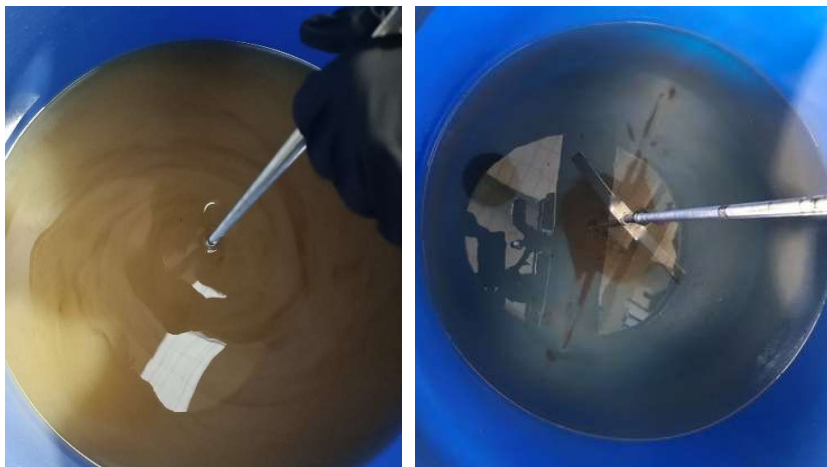


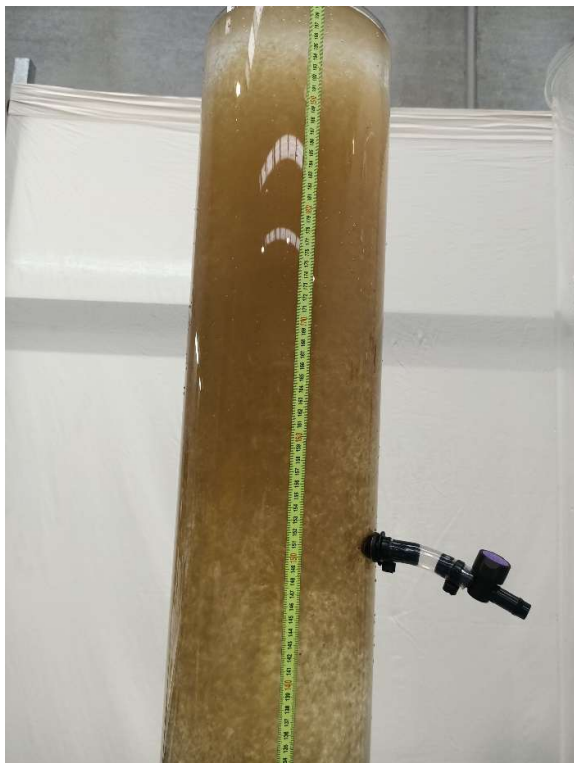
Figure 5 Slow mix suspended floc formation (Left) and Floc settling during slow mix (Right)



1.2.2 Settling

Sample was transferred to the columns by opening a 50mm ball valve at the base of the lifted mixing barrel and dropping the sample down the inside wall of the column. Despite the turbulence created by the transfer, flocs were still present in the columns following the transfer process.

Figure 6 Column Settler showing Floc reformation after water transfer



The main settling interface depth was measured, and Supernatant samples were taken at the following times during the settling phase:

5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes and 40 minutes, 60 minutes and 24 hours/Next Day.

This supernatant was then tested for UVT, Turbidity and pH and some samples were analysed further for metals removal for the Port 1 30min samples and Next Day samples (or nearest equivalent sample).

Active Water Treatment Testing Report

Appendix M – Treatment Process Confirmation Testing

Prepared For:	BT Mining/Bathurst Resources
Prepared By:	Process Flow
Date:	27/03/2026
Document Number:	PFL-2408-PRO-RPT-000014

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A	Draft	Issued for Internal Process Flow Review	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	15/09/2025
0	For Use	Updated for Modified Guideline Values	E Manhart & L Donaldson	E Manhart & G Smith	G Smith	28/11/2025
1	For Use	Updated following client comments			G Smith	27/03/2026

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1 TREATMENT PROCESS CONFIRMATION TESTING AND ALUMINIUM REMOVAL

1.1 Summary

Testing has shown that removal of metals and other contaminants from the test sites AMD raw water is possible to the limits of the modified Guideline Values. With the water tested at bench and column scale, it was observed that there was an Aluminium residual and at times Cobalt, Nickel, Manganese, and Zinc, which continued to be slightly elevated for some results.

For details refer to Reports PFL-2408-PRO-RPT-00001 - Appendices A-L to PFL-2408-PRO-RPT-00015 - Appendix N Guidelines Summary Tables V4 modified 190326.

Reduction of Cobalt, Nickel, Manganese and Zinc has been possible at higher neutralisation pHs but this still leaves an Aluminium residual if the final treated water pH is high.

To mitigate this, trials were performed simulating a process of lowering the final treated pH of the supernatant from our previous treatment process of neutralisation, coagulation, flocculation and settling and providing additional settling time to allow further aluminium precipitates to settle. For this testing we used supernatant from previous barrel tests of one known water quality (Manchester St January 2025 Sample).

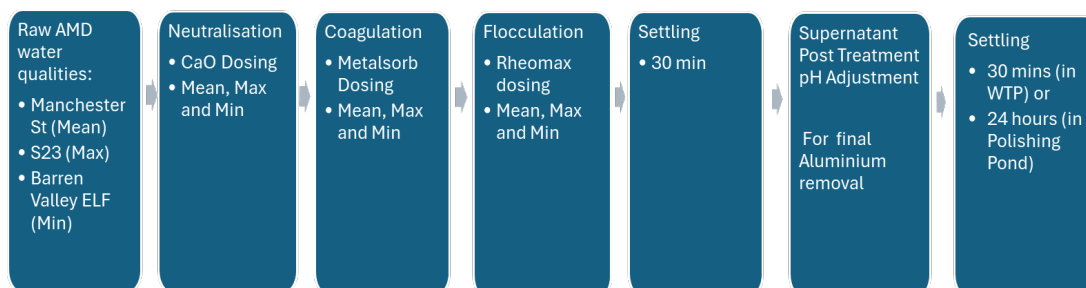
The aim was to determine if the Aluminium residual could be reduced by further settling (for 24 hours after pH adjustment to simulate the effect of a polishing pond).

The results of the aluminium residual showed promising reduction after this additional process. It was discussed that this may be possible to be achieved with a shorter post treatment settling time of 30 minutes, which would then give the possibility of this occurring at the WTP in another settling vessel, rather than relying on the polishing pond for this purpose.

As a confirmation of these results, a full set of process simulations were performed at bench scale on all three water types previously tested, using 30 minute and 24-hour settling times post WTP setting and pH adjustment. Fresh samples of the Barren Valley ELF, Manchester St and S23 water samples were used for this testing and Raw Water Quality of these was tested and compared to previous testing to calculate new dosing rates for neutralisation, coagulation and flocculation chemicals.

The full treatment process simulated is shown below.

Figure 1 Treatment Processes used in Confirmation Testing



Modified Guideline Values have been developed by Dr Chris Hickey for this project (refer to PFL-2408-PRO-RPT-00014 - Appendix N Guidelines Summary Tables V4 modified 190326) and are compared here with this set of testing supernatant which represents the process result for expected discharge water quality (from bench testing scale only). Reproduction of these tests at larger scale is recommended prior to detailed design of the WTP, with a pilot plant recommended to confirm scaling up of the process and continued compliance with limits at scale.

2 TESTING METHODOLOGIES

The following methodologies describe both the aluminium removal trial and the final confirmation trial. Testing was performed at Process Flow in house process laboratory.

2.1 Method – Aluminium removal trial

This section describes the aluminium removal process testing that was performed on post treated water which is Simulated WTP Supernatant from PF testing. The work involved the following:

- Post WTP Treatment pH adjustment with Sulphuric Acid to pH 7 and pH 6.5, followed by
- 24 hrs settling and testing Aluminium levels post settling.

The Supernatants tested in this portion of work were taken from the Barrel Testing which was carried out in January 2025. The Barrel Test Supernatant work is documented in PFL-2408-PRO-RPT-00003.

2.2 Aluminium Removal Process Flow Inhouse testing

The in-house testing at Process Flow, were preliminary process trials, which initially produced a set of in house test results. Further water quality testing was carried out by Hills Laboratory which included more metals and other parameters.

The Process Flow in house testing was performed on the following equipment:

Bench Testing Equipment:

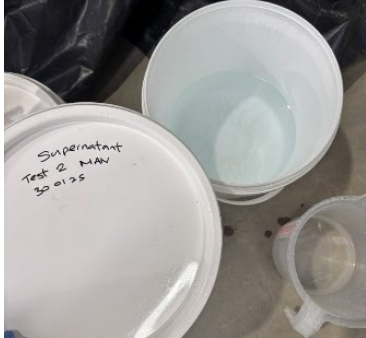
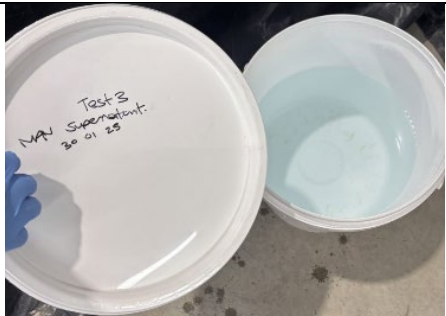
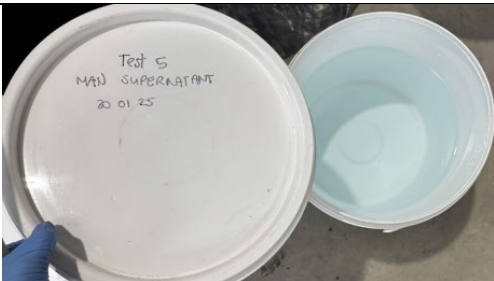
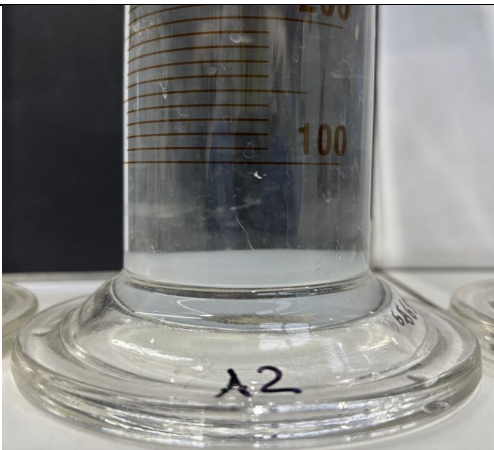
- A Boltac Infinity Jar Stirrer and four 1 litres jars were used for rapid and slow mixing process phases.
- Four x 1 litre glass graduated cylinders were used for bench settling tests.
- Hach DR3900 Spectrophotometer was used for dissolved metals, alkalinity and hardness testing.
- Realtech UVT meter used for UVT254 measurement
- Hanna Handheld Turbidimeter used for Turbidity measurement
- Hanna Bench top pH Meter for pH measurement

Detailed Steps involved were:

1. Supernatant Samples were taken from Barrel tests T2, T3 & T5
2. Duplicate 1L samples in Jar stirrer with speed set to 350RPM
3. Record initial pH
4. Add Sulphuric acid (1 % v/v solution) in increments and wait 1-2 minutes after each addition to allow pH to stabilise
5. Continue until pH 7 (2 jars) and pH 6.5 (2 Jars) has been reached
6. Record pH, time and volume of Sulphuric added at each intermediary step
7. Reduce mixing speed to 20RPM for 10 mins Slow Stir to allow floc formation
8. Decant into 1L glass settling columns and allow to settle for 24 hours
9. Measure Aluminium, UVT, Turbidity and pH after 24 hrs settling (simulating discharge from a polishing pond).
10. Measure Aluminium, UVT, Turbidity and pH of untreated Supernatant samples after approximately 24hrs settling, (simulating discharge from a polishing pond)

The table below shows the supernatant quality of the water used for these tests and an example of the aluminium settled floc.

Table 1 Aluminium Removal Testing using Barrel Test Supernatant created 30 January 2025

TREATMENT PROCESSES	COMMENTS	PHOTOS
Barrel Test Supernatant TEST 2 using Manchester St Sample January 2025 Neutralisation, Coagulation, Flocculation and 30 minutes Settling	This Supernatant was produced in the same method as the Manchester St Bench and Column Tests with Metalsorb and Rheomax	
Barrel Test Supernatant TEST 3 using Manchester St Sample January 2025 Neutralisation, Coagulation, Flocculation and 30 minutes Settling	This Supernatant was produced in the same method as the Manchester St Bench and Column Tests with Metalsorb and Rheomax	
Barrel Test Supernatant TEST 5 using Manchester St Sample January 2025 Neutralisation, Coagulation, Flocculation and 30 minutes Settling	This Supernatant was produced in the same method as the Manchester St Bench and Column Tests with Metalsorb and Rheomax	
Barrel Test Supernatant with pH Adjustment to pH 6.5 with Sulphuric Acid	Settled Aluminium Floccs visible after pH Adjustment and 24hrs settling	

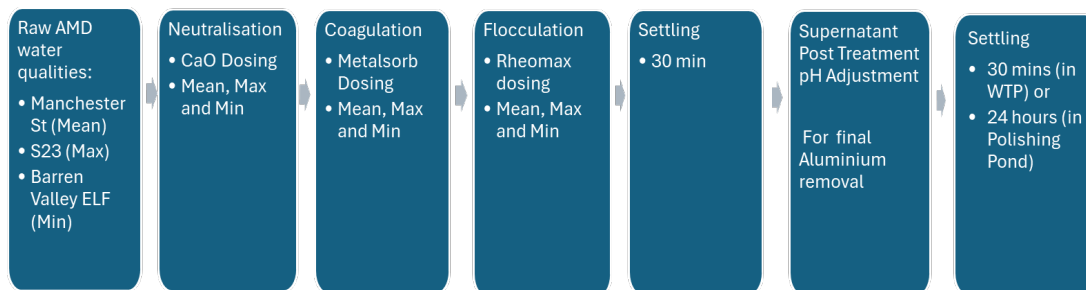
Inhouse Results are as shown later in this report in Table 10 below in the results section. Aluminium removal was achieved by this trial process, see dissolved aluminium results in Table 11 below. (The settling time may be optimised further by trialling 30 minutes and 2 hours settling to compare with the polishing pond 24 hours trial here.)

2.3 Methodology for Treatment Process Confirmation Testing

Once the Aluminium removal process was trialled and the potential was seen to use this as an additional polishing process following the trialled WTP processes. The next set of tests then were to trial all WTP processes again, including the aluminium removal process this time.

In the Treatment Process Confirmation Testing, the processes used were as follows:

Figure 2 Treatment Processes used in Confirmation Testing



All three water quality Raw Waters for the full treatment process, were trialled with new samples gathered (25th July 2025 from Barren Valley ELF, Manchester and S23)

1. Sample Raw water quality was tested as per previous Raw Water Testing parameters.
2. Bench scale jar testing was done first confirming chemical dosing on new waters via in house pH, Iron and Aluminium testing.
3. Once new chemical doses were calculated and tested, the bench testing scale treatment process shown above, with Neutralisation, Coagulation, Flocculation and 30 minutes Settling were performed. The Supernatant was tested after 30-minute settling. This is what we call Supernatant 3 type in the results and is used to compare to previous WTP simulation testing results as it is the same process. There is no final pH adjustment of these samples.
4. The next samples prepared are by taking the WTP simulated Supernatant after pH Adjustment with 1% Sulphuric Acid and 30 mins additional settling, (mimic for WTP 30 mins settle, pH adjust and a second WTP 30mins settle) - this is what we call Supernatant 4 type in the results.
5. The next samples prepared are by taking the WTP simulated Supernatant after pH Adjustment with 1% Sulphuric Acid and 24 hours additional settling (mimic for Polishing Pond 24 hours settle, pH adjust and polishing pond 24 hours settle)- this is what we call Supernatant 5 type in the results.

Water Quality testing included for Raw and Supernatant Items 3,4 and 5 above included TSS, pH Turbidity, Alkalinity, Acid to pH 8.3, Metals, Sodium, Chloride, Sulphate, DOC, UVT. The full list of testing is included in results below.

The estimated Samples volume needed per water were:

- 2.5 litres for each of Item 3, 4 and 5 (times 3 for each raw water)
- 2.5 litres for Raw (times 3 for each raw water)

The reagents were prepared with Supernatant Makeup Water, to represent the WTP plant conditions, as follows:

- CaO 20% Slurry prepared using 80g Graymont CaO and 400mL of Supernatant from the Barrel T2
- Metalsorb 0.1% solution prepared using 1L of Supernatant from the Barrel T2 and 1 mL of Metalsorb concentrate
- Rheomax 0.1% solution prepared using 1 L or Supernatant from Barrel T2 and 1g of Rheomax 1050 powder.

2.4 Treatment Process Dosing Basis for Supernatant 3 Sample

The supernatant in the WTP simulation for Supernatant 3 samples has been produced using the method of treatment as per the previous treatment report PFL-2408-PRO-RPT-00002 -Bench and Column Water Treatment Tests_Rev0.

The process involved the following:

- Neutralisation Lime Dosing (CaO), rapid mixing and neutralising residence time
- Metal Chelating Agent/Coagulant Dosing, rapid mixing and residence time
- Flocculant Dosing and rapid mixing and residence time
- Floc formation, slow mixing and residence time
- Settling process, settling time and velocity of settled interface
- Treated Water Polishing Pond/Sump, simulated as next day 24 hr settling results

In the previous report the following chemicals and reagents were found to be the best combination for treatment of the Mean quality Raw Water (Manchester St).

- CaO – Dosed at 260g/m³ (neutralisation time 20 minutes mixing at 350rpm)
- Metalsorb FZA – Dosed at 2g/m³ (Flash mixed for 1 min at 350 rpm)
- Rheomax 1050 – Dosed at 1-1.5g/m³ (Flash mixed for 1 min at 350 rpm)
- Flocculation time 10 minutes
- Settling Time 20-30 minutes

These doses were used as basis for the confirmation testing but were adjusted to the new raw water samples water quality. Actual doses used are seen in the testing data in Appendix B Raw In-House Results.

2.5 Treatment Process Dosing Basis for the Supernatant 4 and 5 Samples

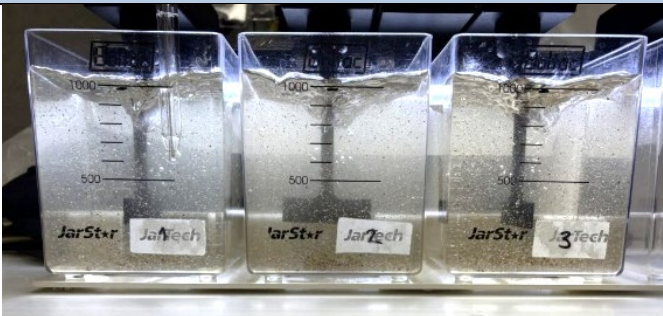
Treatment Process for the Supernatant 4 and 5 was the addition of Sulphuric Acid Sulphuric to lower pH post WTP (Supernatant 3) stage, prior to an additional settling phase (30-minute settling for Supernatant 4 and 24 hours settling for Supernatant 5). The average Sulphuric acid doses for each treated water is as follows:

- Barren Valley ELF Treated Supernatant – average 0.333mL/Litre of 1% Sulphuric Solution added (3.3 g/m³ 100% Sulphuric Acid dose)
- Manchester St Treated Supernatant- average 0.295mL/Litre of 1% Sulphuric Solution added (2.95 g/m³ 100% Sulphuric Acid dose) Manchester St Treated Supernatant
- S23 Treated Supernatant – average 0.202 mL/Litre of 1% Sulphuric Solution added (2.02 g/m³ 100% Sulphuric Acid dose)

3 RESULTS DISCUSSION

The replication of neutralisation, coagulation, flocculation and the first setting stage all performed well, with comparable settling to previous testing as the table below shows. The table below shows the three different water types, during the first stages of the WTP processes up to the first settling stage.

Table 2 Summary of Confirmation Testing of 3 Water Types up to Supernatant 3 Stage (BVE, Man & S23)

PROCESSES	COMMENTS	PHOTOS LEFT TO RIGHT : BVE, MAN ST, S23
Start of Test	Sediment added, no Neutralent, Coagulant, Flocculant	
Rapid Mix 20 minute 350 RPM	Neutralisation	
Slow Stir 10 minutes 20 RPM	Coagulant and Flocculant Added	
Settling (first settling stage)	Left: Start of settling Right: After 30mins Settling	

3.1 Aluminium Removal Testing Results

This testing was performed prior to the confirmation testing on Manchester St water only.

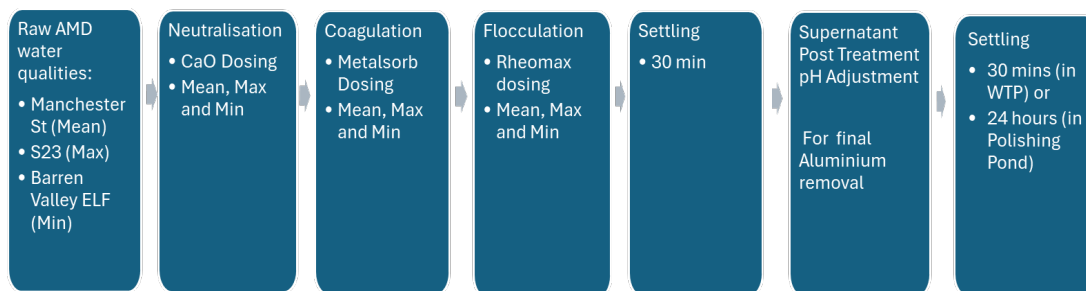
The results of the aluminium residual from removal testing showed promising reduction after this additional 24-hour settling process. It was discussed that this may be possible to be achieved with a shorter post treatment settling time of 30 minutes, which would then give the possibility of this occurring at the WTP in another settling vessel, rather than relying on the polishing pond for this purpose.

All Guideline Values and treatment targets were met for all the Levels Of Protection (LOP) with the aluminium removal treatment process.

3.2 Confirmation Testing Results

Processes used in the testing are as follows:

Figure 33 Treatment Processes used in Confirmation Testing



The Supernatant sample results in the confirmation testing are named as follows:

3.2.1 Manchester St Tests

- Run 1 –Man Super 3, this refers to Supernatant 3, which is after the first 30min settling phase
- Run 2 – Man Super 4, this refers Supernatant 4, which is after the initial 30-minute settling phase, is Post treatment pH adjusted and then sampled after a second 30 min settling phase
- Run 3 -Man Super 5, this refers to Supernatant 5, which is after the initial 30-minute settling phase, is Post treatment pH adjusted and then sampled after a 24-hour settling phase

3.2.2 Barren Valley ELF Tests

- Run 4-BVE Super 3 this refers to Supernatant 3, which is after the first 30min settling phase
- Run 5 – BVE Super 4, this refers Supernatant 4, which is after the initial 30-minute settling phase, is Post treatment pH adjusted and then sampled after a second 30 min settling phase
- Run 6 – BVE Super 5, this refers to Supernatant 5, which is after the initial 30-minute settling phase, is Post treatment pH adjusted and then sampled after a 24-hour settling phase

3.2.3 S23 Tests

- Run 7 – S23 Super 3, this refers to Supernatant 3, which is after the first 30min settling phase

- Run 8 – S23 Super 4, this refers Supernatant 4, which is after the initial 30-minute settling phase, is Post treatment pH adjusted and then sampled after a second 30 min settling phase
- Run 9 – S23Super 5 – this refers to Supernatant 5, which is after the initial 30-minute settling phase, is Post treatment pH adjusted and then sampled after a 24-hour settling phase

3.2.4 Confirmation Testing Results – Manchester St

Run 1,2 and 3 show Manchester St Sample water treatment. The results showed good compliance for all three stages of treatment (Super 3,4 and 5), with Super 4 and 5 samples giving slightly better cobalt results and pH compliance.

Run 1, with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling only (Super 3), showed compliance with all Modified Guideline Values except dissolved cobalt at 95% and 90% LOPs. The pH did not comply with the target and was slightly elevated at pH7.2.

Run 2 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 30mins settling (Super 4), showed compliance with all Modified Guideline Values except dissolved cobalt at 95% LOP.

Run 3 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 24hrs settling (Super 5), showed compliance with all Modified Guideline Values except dissolved cobalt at 95 % LOP.

3.2.5 Confirmation Testing Results – Barren Valley ELF

Run 4, 5 and 6 show BVE Sample water treatment. The results showed

Run 4, with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling only (Super 3), showed compliance with all Modified Guideline Values except dissolved cobalt at all LOPs and Nickel at LOP 95%. Target pH was not complied with also being slightly elevated at pH7.2.

Run 5 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 30mins settling (Super 4), showed compliance with all Modified Guideline Values except dissolved cobalt at all LOPs and Nickel at 95% LOP.

Run 6 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 24hrs settling (Super 5), showed compliance with all Modified Guideline Values except dissolved cobalt at all LOPs, Nickel at 95 and 90% LOPs and Zinc at 95 and 90% LOPs.

3.2.6 Confirmation Testing Results – S23

Run 7, with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling only (Super 3), showed compliance with all Modified Guideline Values except dissolved cobalt at 95% LOP and Manganese at LOP 95%.

Run 8 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 30mins settling (Super 4), showed compliance with all Modified Guideline

Values except dissolved cobalt at 95 and 90% LOP, manganese at 95 and 90% LOP, and Iron plus Manganese at all LOP.

Run 9 with treatment with Neutralisation, Coagulation, Flocculation and 30 minutes settling, plus pH adjustment and further 24hrs settling (Super 5), showed compliance with all Modified Guideline Values except dissolved cobalt at all LOPs, manganese at 95 and 90% LOP, and Iron plus Manganese at all LOP.

4 CONCLUSIONS FROM CONFIRMATION TESTING

Testing has confirmed that Manchester St water quality type water is able to meet the guideline values and treatment targets for all water quality parameters tested except Cobalt

Barren Valley ELF and S23 water types would need more optimisation to comply, and this would most likely be in the form of higher neutralisation pH, to remove metals such as Nickel and Manganese to lower residual levels.

Figure 4 Barren Valley ELF, Manchester St and S23 AMD at Slow stir Flocculation stage



4.1 Process Considerations for Full Scale WTP Design

1. Neutralisation in some cases needed more than 20 minutes, sometimes closer to 30 minutes for pH to stabilize, particularly for the cleaner waters. The poorer quality waters needed closer to 20 minutes. For previous testing we had used 20 minutes neutralisation as a standard time for comparison between results.

Implications for scaling up should consider including an allowance for extended neutralisation to 30 minutes to allow for variability in neutralisation times.

2. Water Temperatures for this testing were usually in the range 8-11°C. In previous testing (Bench scale, Columns and Barrels) water temperatures ranged from 10 to 22°C, depending on the time of year the tests were done.

Implications for the full scale WTP are that the chemical reaction times and dosing may be affected by water temperature fluctuations and allowance should be made for that in the final process design.

3. In testing the pH, it was difficult to achieve pH 8 accurately using the 20% CaO slurry at bench scale, particularly when treating the higher quality water (Barren Valley ELF). The 20% slurry

dose equates to a low number of mls dose, with any variability in the slurry consistency or particle size having potential to have a larger effect than it would at full plant scale.

Implications for full plant scale are that this dosing accuracy would improve with larger pipework and valves in relation to the slurry particle size.

4. Surface flow and Floc coating on pH meter was evident in both 1st and 2nd flocculation stages in the slow mix phase. The flocs from both flocculation mixing stages tend to be sticky so there is a need to consider clogging and maintenance of equipment including pH meters and samplers. On the first stage of settling some flocs were observed floating on the surface of the settling column. These could contribute to floc carry-over and cause a poor treatment result. Allowance should be made to skim these off or have a subsurface outlet.

Implications for the full scale WTP are, sampling for pH for full scale process control would need to prevent fouling of pH meters, or a self-cleaning probe arrangement. Consider location of outlets of the clarifiers.

5. When higher Neutralisation pH was reached, the second stage flocculation (Aluminium precipitation) had larger flocs which appeared to settle more readily.

There is potentially a benefit for final pH trimming and Aluminium removal (for settling stage two) of having excess CaO left in solution after the initial settling phase, to provide additional seeding for precipitated aluminium.

Implications for the WTP are that raising neutralisation may provide a dual benefit of improved non-aluminium metal removal at stage one settling and give extra CaO particulates for seeding the aluminium removal by the settling stage two.

6. During the Second stage flocculation the flocs were difficult to see. It may be beneficial to consider using a coagulant at this stage also if good Aluminium removal is not achieved, as this may improve settling.

Results however did show good Aluminium removal was possible, even with low visibility of floc.

7. The coagulant made up with the supernatant (process water) had a visible brown sediment in the bottom. It is unclear if this sediment came from the supernatant (possibly) and changed colour when the concentrated reagent was added or whether the sediment formed when the reagent was prepared. This was not observed in the flocculant prepared with Deionised water and not in the previous testing when flocculant was prepared with supernatant.

8. Supernatant recovery volume was about 90% of settling of stage 1 settling and 90% of the stage 2 settling (81% of original AMD).

Implication for full scale supernatant volumes would be that the full-scale separating techniques may produce even more efficiency of supernatant decant.

9. For the final pH trimming the pH took about 3-4 mins to stabilize following the addition of acid (with 350RPM stirring).

Implications for full scale WTP plant are that vessel sizing should allow for this and also some variability depending on effectiveness of dosing.

10. Chemical makeup water effects

It is noted that the coagulant/chelating agent Metalsorb solution was prepared using Barrel Test 2 Supernatant to replicate WTP conditions, where supernatant would be used for process and service water. In previous Barrel and Bench testing Deionised water had been used to prepare chemical dosing solutions, to prevent chemical interference from any contaminants in the water, for testing.

The Barrel 2 Supernatant for Metalsorb makeup had some residual sediment/flocs present. In the supernatant the flocs were white in appearance and after preparation of the Metalsorb Coagulant a dark brown sediment was visible which settled out in the bottle. (Note this was not observed during the earlier chemical makeup testing).

Reaction between the supernatant and concentrated Metalsorb could have reduced the effectiveness of the coagulant due to being partially used up in chemical solution preparation.

At full scale, this would need to be accounted for by adding a dose adjustment to ensure the required dosing potential of the solution is available.

4.2 Scale up considerations

Process variability at bench scale highlights the potential for variability at full scale.

Factors crucial to full scale WTP design will be as follows:

- the scale up and adjustment of dosing rates,
- accounting for metals residuals in the chemical makeup water and their effect on dose rates
- the variability of the raw AMD water quality, including sediment loading variability on acidity
- the AMD response to a range of dosing rates and
- the sensitivity of both the neutralisation phase and the aluminium removal process to change in pH.

The sensitivity of both the neutralisation and aluminium processes to pH has been highlighted in our confirmation testing. The wider implication of pH sensitivity is that the process control of all chemical dosing will be crucial to the performance of the metal's removal processes.

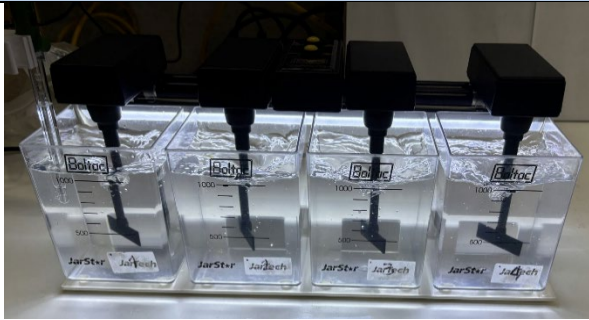
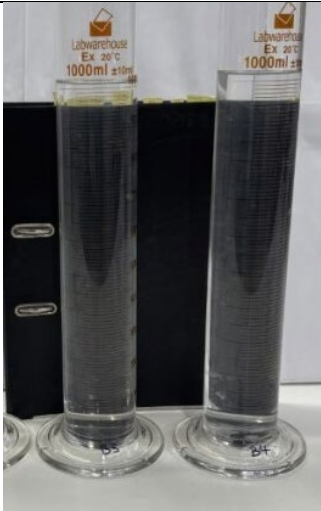
5 RESULTS RECORD

This section provides a more detailed record of the testing process and the water quality results.

5.1 Aluminium Removal Testing Photos Record

Testing photos for the aluminium trail are below.

Table 3 Manchester St AMD - Supernatant Aluminium Removal Photo record ALT 1 Test

TREATMENT PROCESSES	COMMENTS	PHOTOS
Rapid Mix 1 minute 350 RPM	Supernatant from Barrel Tests, mixed with 1% Sulphuric acid	
Slow Stir 10 minutes 30 RPM	Supernatant after pH reduction with 1% Sulphuric Acid	
Start of Settle		

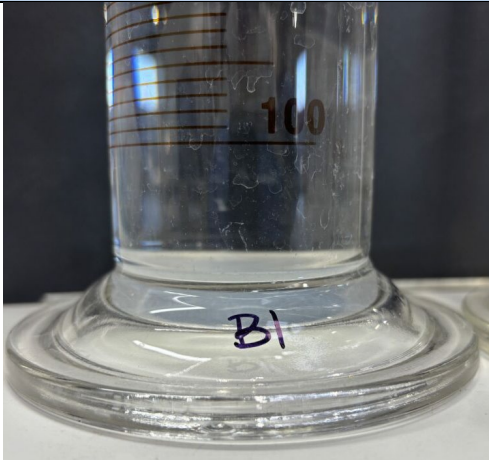
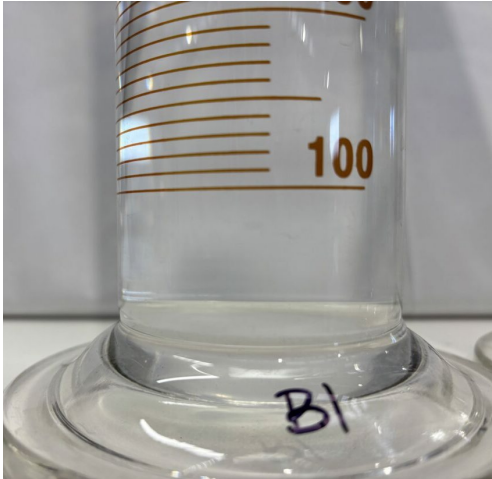
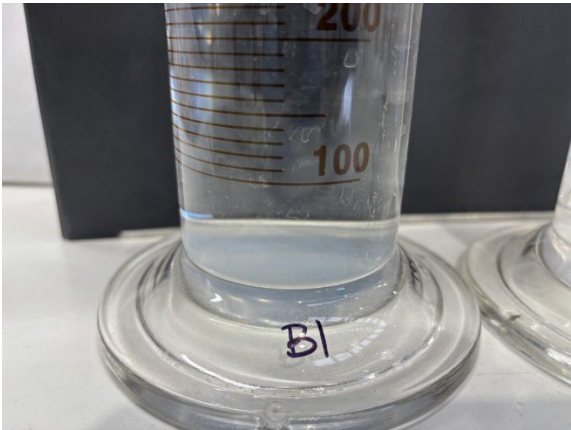
TREATMENT PROCESSES	COMMENTS	PHOTOS
Settle 24 hours	After 24 hour Settle Mimic of second settle Polishing Pond	  

Table 4 Manchester St AMD - Supernatant Aluminium Removal Photo record ALT 2 Test

Rapid Mix 1 minute 350 RPM	Supernatant from Barrel Tests, MAN 5 mixed with 1% Sulphuric acid	
Slow Stir 10 minutes 30 RPM	End of Slow Mix - Supernatant after pH reduction with 1% Sulphuric Acid Precipitate haze or fine floc visible. (Below) Floc visible in jar base after decant to settling columns.	
Start of Settle		

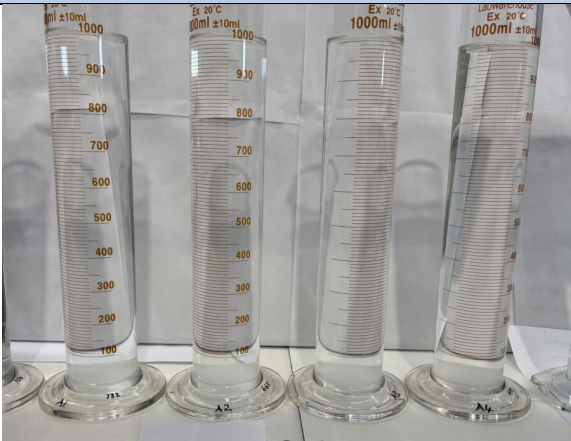
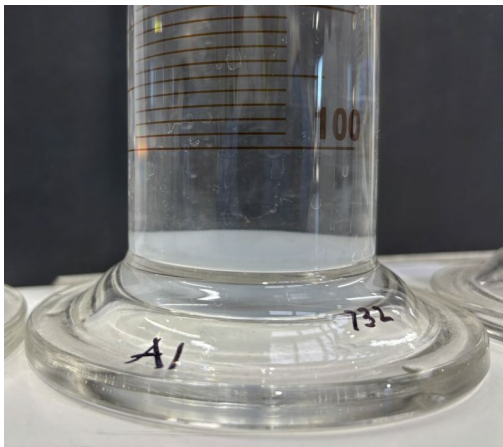
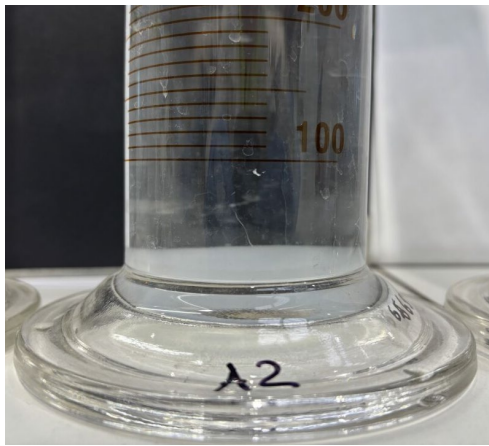
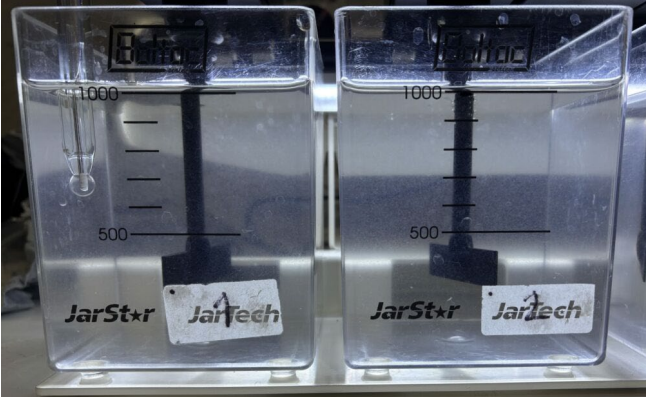
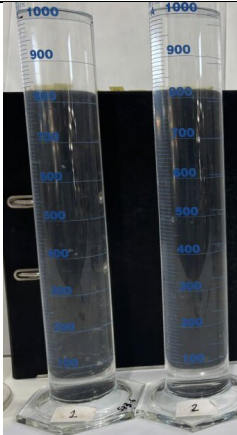
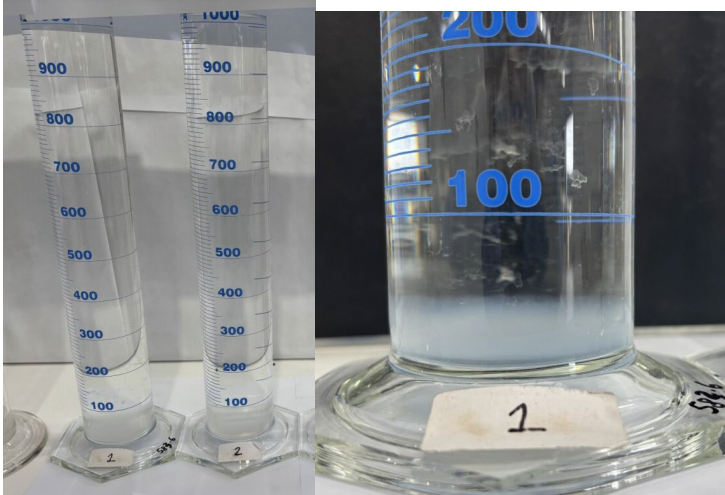
Settle 24 hours	After 24 hour Settle Mimic of second settle Polishing Pond	  

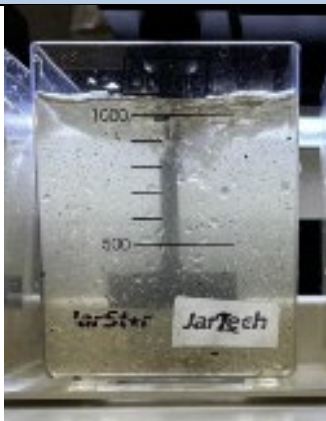
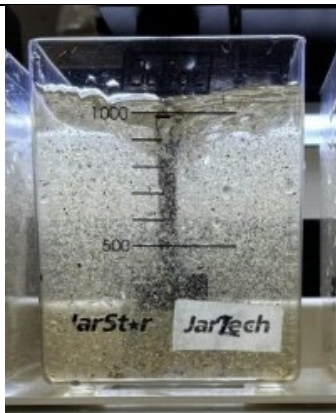
Table 5 Manchester St AMD - Supernatant Aluminium Removal Photo record ALT 3 Test

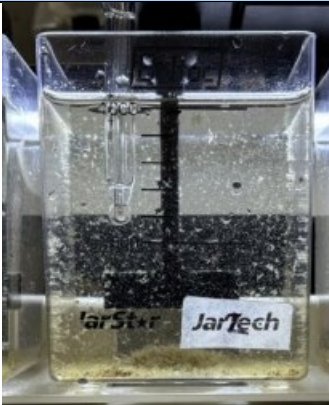
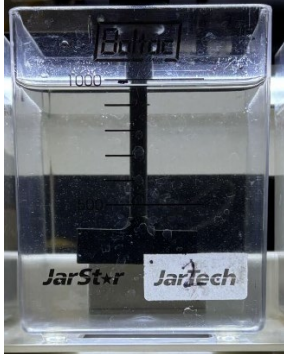
Rapid Mix 1 minute 350 RPM	Using T3 Barrel Supernatant, start of Rapid Mix before acid addition	
Rapid Mix 1 minute 350 RPM	Supernatant from Barrel Tests, MAN 5 mixed with 1% Sulphuric acid	
Slow Stir 10 minutes 30 RPM	End of Slow Mix - Supernatant after pH reduction with 1% Sulphuric Acid Precipitate haze or fine floc visible. (Below) Floc visible in jar base after decanting to settling columns.	
Start of Settle		

Settle 24 hours	After 24-hour Settle Mimic of second settle Polishing Pond (Right) Showing approx. 10mm of white fluffy flocs on base of cylinder	
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5.2 Barren Valley ELF Jar Test Photo Record

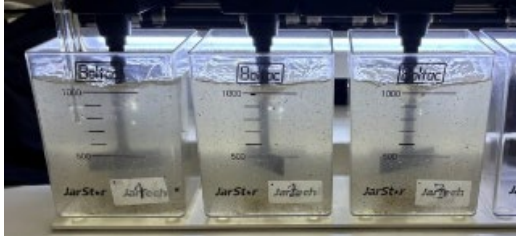
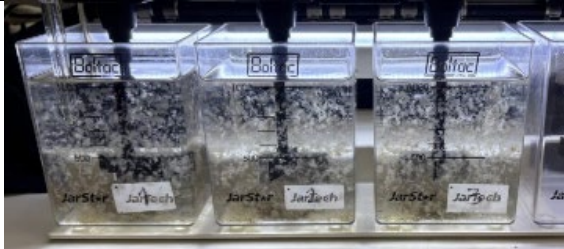
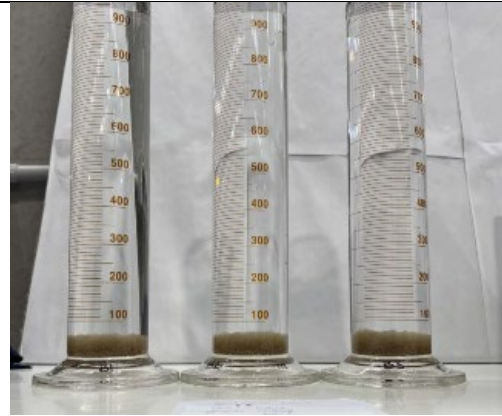
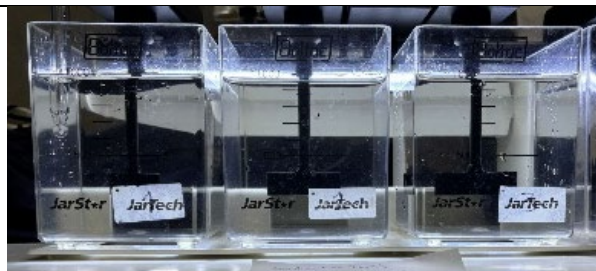
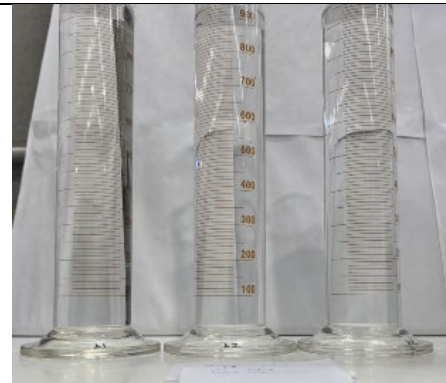
Table 6 Barren Valley ELF AMD Treatment Process Photo Record

TREATMENT PROCESSES	COMMENTS	PHOTOS
Neutralisation 20 minutes Rapid Mix 350RPM	CaO 20% Slurry Addition and Rapid Mix	
Start of Slow Stir 1 10 minutes Slow Mix 30RPM	Coagulation/Flocculation stage after Addition of 0.1% Solutions of Metalsorb and Rheomax.	

TREATMENT PROCESSES	COMMENTS	PHOTOS
End of Slow Stir 1	Note that some settling is occurring in slow mix phase.	
Settle 1 30 minutes	Mimic of first settle in WTP Clarifier	
Slow Stir 2	Supernatant after pH reduction with 1% Sulphuric Acid	
Settle 2 30 minutes	Mimic of second settle in WTP Clarifier Note the 24-hour settling process looked similar to the 30 minute settling.	

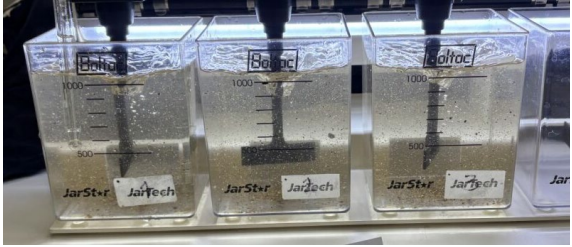
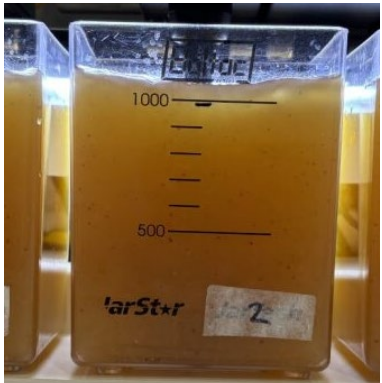
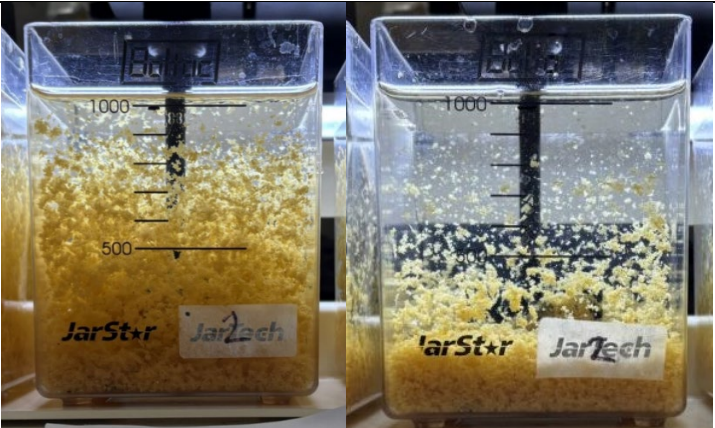
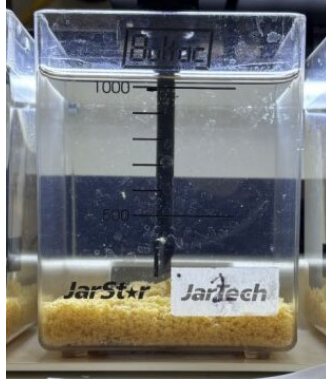
5.3 Photos – Manchester St Jar Test Photo Record

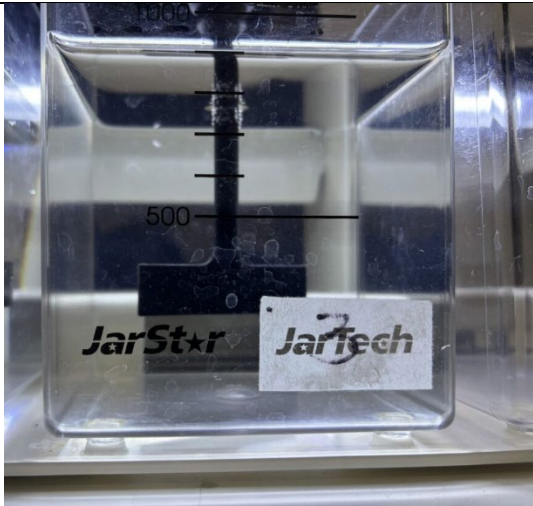
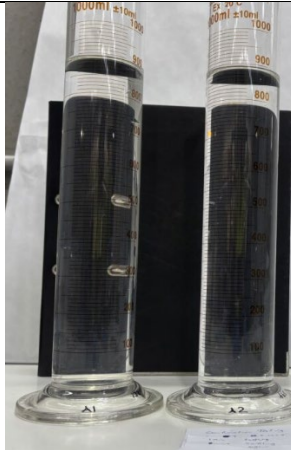
Table 7 Manchester St AMD Treatment Processes Photo Record

TREATMENT PROCESSES	COMMENTS	PHOTOS
Neutralisation 20 minutes Rapid Mix 350RPM	CaO 20% Slurry Addition and Rapid Mix	
Start of Slow Stir 1 10 minutes Slow Mix 30RPM	Coagulation/Flocculation stage after Addition of 0.1% Solutions of Metalsorb and Rheomax.	
Settle 1 30 minutes	Mimic of first settle in WTP Clarifier	
Slow Stir 2	Supernatant after pH reduction with 1% Sulphuric Acid	
Settle 2 30 minutes	Mimic of second settle in WTP Clarifier Note the 24-hour settling process looked similar to the 30 minute settling.	

5.4 S23 Jar Test Photo Record

Table 8 S23 AMD Treatment Processes Photo Record

TREATMENT PROCESSES	COMMENTS	PHOTOS
Neutralisation 20 minutes Rapid Mix 350RPM	CaO 20% Slurry Addition (Above) and Rapid Mix (Below)	 
Start of Slow Stir 1 10 minutes Slow Mix 30RPM	Start (Left) and Mid (Right) slow stir, Coagulation/Flocculation stage after Addition of 0.1% Solutions of Metalsorb and Rheomax.	
End of Slow Stir 1	Note settling of floc during slow stir had occurred	

TREATMENT PROCESSES	COMMENTS	PHOTOS
Settle 1 30 minutes	Mimic of first settle in WTP Clarifier	
Slow Stir 2	Supernatant after pH reduction with 1% Sulphuric Acid	
Settle 2 30 minutes	Mimic of second settle in WTP Clarifier Note the 24-hour settling process looked similar to the 30 minute settling.	

5.5 Aluminium Removal Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 9 Aluminium Removal Testing Process Parameters using Column Supernatant for Neutralisation, Coagulation, Flocculation and 24 Hours Settling

PF Test Number Identifier and Date Sample Sent for Analysis		ALT1 JIJ2 24H 16-Jul-2025	ALT2 JIJ2 24H 16-Jul-2025	ALT3 JIJ2 24H 17-Jul-2025
Hills Lab Number:		3942629.1	3942629.2	3942629.3
Sample		T2 Barrel Manchester Supernatant Jan 2025	T5 Barrel Manchester Supernatant Jan 2025	T3 Barrel Manchester Supernatant 30 Jan 2025
Neutralent		CaO	CaO	CaO
Dose				
Coagulant		Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax
Sediment added		None	None	None
Rapid Mix time (Neutralisation)	minutes	20	20	20
Rapid Mix time for coagulant addition	minutes	1	1	1
Rapid Mix time for coagulant addition	minutes	1	1	1
First Slow Mix Time	minutes	10	10	10
First Settling Time	minutes	30 mins	30 mins	30 mins
Al Removal Test Vessel Size		1 L	1 L	1 L
Additional pH modification		Sulphuric acid 1%	Sulphuric acid 1%	Sulphuric acid 1%
Amount of 1% acid added	mL 1%	0.35	1.15	5
Dose of 100% Sulphuric	g/m3	3.5	11.5	50
Second Slow stir time		10	10	10
Second Settling Time	hours	24 hours	24 hours	24 hours

Table 10 Supernatant Water Quality Results – Aluminium Removal Testing July 2025 – Barrel Test Supernatant with pH adjustment, Flocculation and Settling – Inhouse Results

WTP Output Treated Water Sample prior to final pH adjustment	Units	T2 Barrel Supernatant Jan 2025	T5 Barrel Supernatant Jan 2025	T3 Barrel Supernatant Jan 2025
Parameters prior to pH Adjustment with Sulphuric acid and settling				
pH Hills test Jan 25)		7.9	9.7	10.9
pH (start of in house test July 25)		8	9.3	11.05
Supernatant Dissolved Aluminium (Hills Tests Jan 25)	mg/l	1.67	7.7	14.9
Supernatant Dissolved Aluminium (via in house Spectro testing July 25)	mg/l	0.8	>3.5	>3.5
UVT (in house)	%	96.1	97.8	97.1
Turbidity (in house)	NTU	2.73	5.42	2.62
Parameters after pH Adjustment to target pH 6.5 with Sulphuric acid and 24 hr settling (in house testing)				
pH (end of in house test July 25)		6.55	6.68	6.63
pH Treated Target		4.5-7	4.5-7	4.5-7
Supernatant Dissolved Aluminium (via in house Spectro testing July 25)	mg/l	0.143	0.413	0.627
Dissolved Aluminium Chronic GV 95%	g/m3	0.17	0.17	0.17
Dissolved Aluminium Chronic GV 90%	g/m3	0.21	0.22	0.22
Dissolved Aluminium Chronic GV 80%	g/m3	0.29	0.30	0.29
UVT (in house)	%	99.3	99.4	99.3
Turbidity (in house)	NTU	0.46	0.26	0.23
Turbidity Treated Target	NTU	5	5	5

Table 11 Supernatant Water Quality Results – Aluminium Removal Testing July 2025 – Barrel Test Supernatant with pH adjustment, Flocculation and Settling – Hills Results

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
True Hazen Colour	Hazen units			< 10		< 10		< 10
Turbidity	NTU	16.8	2.1	0.31	1.59	0.3	1.23	0.16
Turbidity Target	NTU		5	5	5	5	5	5
pH	pH	3.1	7.9	6.4	9.7	6.7	10.9	6.7
pH Target	pH		4.5-7	4.5-7	4.5-7	4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3*	< 1.0	14.8	5.5	48	6	102	6.9
Total Hardness	g/m3*	197	510	500	520	500	580	570
Electrical Conductivity (EC)	mS/m	103.7		95.5		95.7		105.1
Total Suspended Solids	g/m3	17	9	< 3	15	< 5	6	< 3
TSS Target	g/m3		5	5	5	5	5	5
Total Solids (TS)	g/m3							
Dissolved Aluminium	g/m3	46	1.67	0.074	7.7	0.031	14.9	0.024
Dissolved Aluminium Chronic GV 95%	g/m3		0.24	0.16	0.30	0.17	0.34	0.17
Dissolved Aluminium Chronic GV 90%	g/m3		0.30	0.20	0.38	0.22	0.43	0.22
Dissolved Aluminium Chronic GV 80%	g/m3		0.42	0.28	0.52	0.30	0.58	0.30
Total Aluminium	g/m3			0.172		0.65		0.66
Aluminium Al3+	meq/L			0.0082		0.0035		0.0026
Dissolved Arsenic	g/m3			< 0.0010		< 0.0010		< 0.0010
Dissolved Cadmium	g/m3	0.00082	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037	0.00037	0.00037	0.00037

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069	0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155	0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	53	183	178	210	200	230	230 #2
Total Calcium	g/m3			184		200		230 #2
Dissolved Chromium	g/m3	0.0042	0.0009	0.0011	0.0012	0.0012	0.0013	0.0014
Dissolved Cobalt	g/m3	0.085	0.0007	0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033	0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078	0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208	0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0148	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0007	0.0007	0.0007	0.0007	0.0008	0.0007
Dissolved Copper Chronic GV 90%	g/m3		0.0009	0.0009	0.0009	0.0009	0.0010	0.0009
Dissolved Copper Chronic GV 80%	g/m3		0.0014	0.0014	0.0014	0.0014	0.0016	0.0014
Dissolved Iron	g/m3	3.5	0.02	0.02	0.02	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1.0	1.0	1.0	1.0	1.0	1.0
Dissolved Lead	g/m3	0.00159	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	15.6	13.4	13.3	0.56	0.69	0.08	0.1
Dissolved Manganese	g/m3	1.41	0.158	0.18	0.0005	0.0009	0.0005	0.0008
Dissolved Manganese Chronic GV 95%	g/m3		1.12	1.11	1.13	1.11	1.18	1.17
Dissolved Manganese Chronic GV 90%	g/m3		1.72	1.71	1.74	1.71	1.82	1.80

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
Dissolved Manganese Chronic GV 80%	g/m3		2.81	2.79	2.84	2.79	2.97	2.95
Dissolved Mercury	g/m3			< 0.00010		< 0.00010		< 0.00010
Dissolved Nickel	g/m3	0.2	0.0032	0.0027	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099	0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118	0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154	0.154	0.154	0.154
Dissolved Zinc	g/m3	0.99	< 0.0010	0.0058	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.036	0.122	0.031	0.096	0.033	0.096
Dissolved Zinc Chronic GV 90%	g/m3		0.054	0.182	0.046	0.143	0.049	0.143
Dissolved Zinc Chronic GV 80%	g/m3		0.092	0.313	0.078	0.245	0.084	0.245
Dissolved Organic Carbon (DOC)	g/m3	0.8	< 0.5	< 0.5	< 0.5	< 0.5	0.6	< 0.5
Absorbance at 254 nm	AU cm-1	0.109	0.013	0.004	0.015	0.004	0.004	0.005
Transmittance at 254 nm	%T, 1 cm cell	4.91	97.1	99	96.6	99.2	99.1	98.9
Iron + Manganese		4.91	0.178	0.2	0.0205	0.0209	0.0205	0.0208
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.12	2.11	2.13	2.11	2.18	2.17
Thallium #	g/m3			0.00117		0.00068		0.00058
Sulphate	g/m3			520		520		560
Potassium #	g/m3			8.3		8		8.2
Dissolved Sodium	g/m3			3.8		3.9		3.9 #2
Total Sodium	g/m3			3.9		4		3.9 #2
Acidity (pH 5.5)	g/m3 CaCO3							

PF Test Number Identifier and Date Sample Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	ALT1 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 2	Barrel Test 5 MAN Supernatant Jan 25 30-Jan- 2025	ALT2 JIJ2 24H 16-Jul-2025 using Barrel MAN Test 5	Barrel Test 3 MAN Supernatant Jan 25 30-Jan- 2025	ALT3 JIJ2 24H 17-Jul-2025 using Barrel MAN Test 3
		Raw	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal	Supernatant Before	Supernatant After Al Removal
Acidity (pH 7.0)	g/m3 CaCO ₃							
Total Acidity (pH 8.3)	g/m3 CaCO ₃			2.5		1.9		2.2
Chloride	g/m3			3.6		3.4		3.5
Nitrite-N	g/m3			< 0.002		< 0.002		< 0.002
Nitrate-N	g/m3			< 0.002		0.014		0.01
Nitrate-N + Nitrite-N	g/m3			< 0.002		0.015		0.011

5.6 Sludge Creation Barrel Testing Supernatant Quality Results

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition
 Results that exceed the modified GV are shown in orange.

Table 12 Sludge Creation Barrel Tests Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation and 30 Minutes Settling

PF Test Number Identifier and Date Sample Sent for Analysis		Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025
Hills Lab Number:		3839045.2	3839045.4	3839045.3
Sample		Manchester St New	Manchester St New	Manchester St New
Neutralent		CaO	CaO	CaO
Dose				
Coagulant		Metalsorb	Metalsorb	Metalsorb
Flocculant		Rheomax	Rheomax	Rheomax
Sediment added		None	None	None
Rapid Mix time (Neutralisation)	minutes	20	20	20
Rapid Mix time for coagulant addition		1	1	1
Rapid Mix time for coagulant addition		1	1	1
Slow Mix Time	minutes	10	10	10
Settling Time		30 minutes	30 minutes	30 minutes
Test Vessel Size		Bulk Barrel 175 litres	Bulk Barrel 175 litres	Bulk Barrel 175 litres

Table 13 Supernatant Water Quality Results Sludge Creation Barrel Tests

PF Test Identifier and Date Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025
Turbidity	NTU	16.8	2.1	1.59	1.23
Turbidity Target	NTU		5	5	5
pH	pH	3.1	7.9	9.7	10.9
pH Target	pH		4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3*	< 1.0	14.8	48	102
Total Hardness	g/m3*	197	510	520	580
EC	mS/m	103.7			
TSS	g/m3	17	9	15	6
TSS Target	g/m3		5	5	5
Dissolved Aluminium	g/m3	46	1.67	7.7	14.9
Dissolved Aluminium Chronic GV 95%	g/m3		0.24	0.30	0.34
Dissolved Aluminium Chronic GV 90%	g/m3		0.30	0.38	0.43
Dissolved Aluminium Chronic GV 80%	g/m3		0.42	0.52	0.58
Dissolved Cadmium	g/m3	0.00082	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3		0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3		0.00069	0.00069	0.00069
Dissolved Cadmium Chronic GV 80%	g/m3		0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	53	183	210	230
Dissolved Chromium	g/m3	0.0042	0.0009	0.0012	0.0013
Dissolved Cobalt	g/m3	0.085	0.0007	< 0.0002	< 0.0002
Dissolved Cobalt Chronic GV 95%	g/m3		0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3		0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3		0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.0148	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3		0.0007	0.0007	0.0008

PF Test Identifier and Date Sent for Analysis		Manchester St New Raw Water Sample 30 Jan 2025	Barrel MAN Test 2 Supernatant 30-Jan-2025	Barrel Test 5 MAN Supernatant Jan 25 30-Jan-2025	Barrel Test 3 MAN Supernatant Jan 25 30-Jan-2025
Dissolved Copper Chronic GV 90%	g/m3		0.0009	0.0009	0.0010
Dissolved Copper Chronic GV 80%	g/m3		0.0014	0.0014	0.0016
Dissolved Iron	g/m3	3.5	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3		1.0	1.0	1.0
Dissolved Lead	g/m3	0.00159	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m3	15.6	13.4	0.56	0.08
Dissolved Manganese	g/m3	1.41	0.158	0.0005	0.0005
Dissolved Manganese Chronic GV 95%	g/m3		1.12	1.13	1.18
Dissolved Manganese Chronic GV 90%	g/m3		1.72	1.74	1.82
Dissolved Manganese Chronic GV 80%	g/m3		2.81	2.84	2.97
Dissolved Nickel	g/m3	0.2	0.0032	< 0.0005	< 0.0005
Dissolved Nickel Chronic GV 95%	g/m3		0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3		0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3		0.154	0.154	0.154
Dissolved Zinc	g/m3	0.99	< 0.0010	< 0.0010	< 0.0010
Dissolved Zinc Chronic GV 95%	g/m3		0.036	0.031	0.033
Dissolved Zinc Chronic GV 90%	g/m3		0.054	0.046	0.049
Dissolved Zinc Chronic GV 80%	g/m3		0.092	0.078	0.084
DOC	g/m3	0.8	< 0.5	< 0.5	0.6
Absorbance at 254 nm	AU cm-1	0.109	0.013	0.015	0.004
Transmittance at 254 nm (1 cm cell)	%T,		97.1	96.6	99.1
Iron + Manganese		4.91	0.178	0.0205	0.0205
Dissolved Iron + Manganese Chronic GV 80%/90%/95%			2.12	2.13	2.18

*as CaCO₃

5.7 Confirmation Testing Trial August 2025 – Two Stage Flocculation Supernatant -Water Quality Results for Manchester St Water

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 14 Confirmation Testing August 2025 - Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

Supernatant Type			3 (WTP 30min 1st settled only)	4 (pH adjust, WTP 30min 2nd settling)	5 (pH adjust, Pond 24hr 2nd settling)
PF Test Number Identifier and Date Sample Sent for Analysis			Conf Run 1B 30 Min 06-Aug-2025 3:00 pm	R2 Man Super 4 07-Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm
Hills Lab Number:		3951088.20	3962556.1	3962556.2	3962556.3
Sample		Manchester Raw 25-Jul-2025	Manchester st	Manchester st	Manchester st
Neutralent			CaO	CaO	CaO
Dose		g/m3	230	226	226
Chemical makeup with previous AMD Treated Water Supernatant			Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25
Coagulant			Metalsorb	Metalsorb	Metalsorb
Flocculant			Rheomax	Rheomax	Rheomax
Sediment added			3g	3g	3g
Rapid Mix time (Neutralisation)	minutes		20	20	20
Rapid Mix time for coagulant addition	minutes		1	1	1
Rapid Mix time for flocculant addition	minutes		1	1	1
Slow Mix Time	minutes		10	10	10
Settling Time	minutes		30	30	30
Test Vessel Size			1 L	1 L	1 L
Additional pH modification			0	Sulphuric acid 1%	Sulphuric acid 1%
Amount of 1% acid added	mL 1%		0	0.35	0.32
Dose of 100% Sulphuric	g/m3		0	3.5	3.2
Slow stir time	minutes		0	10	10
Second Settling Time	hrs		0	24	24

Table 15 Supernatant Water Quality Results – Confirmation Testing August 2025 – Manchester St Supernatant with Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Conf Run 1B 30 Min 06- Aug-2025 3:00 pm	R2 Man Super 4 07- Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm
True Hazen Colour	Hazen units	< 10	< 10	< 10	< 10	< 10	< 10
Turbidity	NTU	11.3	23	0.39	0.75	0.11	0.31
Turbidity Target	NTU				5	5	5
pH	pH Units	3.4	3.2	2.5	7.2	6.1	6.2
pH Target	pH Units				4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	< 1.0	< 1.0	< 1.0	7.6	3.2	3.7
Total Hardness	g/m3 as CaCO3	87	230	1140	540	570	550
Electrical Conductivity (EC)	mS/m	50.1	104.4	455	100.3	100.5	100.9
Total Suspended Solids	g/m3	4	16	6	< 3	< 3	< 3
TSS Target	g/m3				5	5	5
Total Solids (TS)	g/m3	280	860	5700	820	810	830
Dissolved Aluminium	g/m3	10.8	44 #1	270	0.061	0.3	0.24
Dissolved Aluminium Chronic GV 95%	g/m3				0.39	0.5	0.5
Dissolved Aluminium Chronic GV 90%	g/m3				0.49	0.5	0.5
Dissolved Aluminium Chronic GV 80%	g/m3				0.67	0.5	0.5
Total Aluminium	g/m3	11.4	43 #1	280	0.41	0.31	0.47
Aluminium Al3+	meq/L	1.2	4.8	31	0.0068	0.033	0.027
Dissolved Arsenic	g/m3	< 0.0010	< 0.0010	0.178	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m3	0.00039	0.00088	0.0047	< 0.00005	< 0.00005	< 0.00005
Dissolved Cadmium Chronic GV 95%	g/m3				0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3				0.00069	0.00069	0.00069

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Conf Run 1B 30 Min 06- Aug-2025 3:00 pm	R2 Man Super 4 07- Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm
Dissolved Cadmium Chronic GV 80%	g/m3				0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	30 #1	62 #1	200 #1	187	199 #1	191 #1
Total Calcium	g/m3	28 #1	57 #1	200 #1	192	194 #1	189 #1
Dissolved Chromium	g/m3	0.0011	0.0045	0.162	0.0008	0.0008	0.0008
Dissolved Cobalt	g/m3	0.049	0.081	0.43	0.0134	0.0078	0.0043
Dissolved Cobalt Chronic GV 95%	g/m3				0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3				0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3				0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.021	0.0133	0.082	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper Chronic GV 95%	g/m3				0.0015	0.0015	0.0011
Dissolved Copper Chronic GV 90%	g/m3				0.0018	0.0018	0.0013
Dissolved Copper Chronic GV 80%	g/m3				0.0029	0.0029	0.0021
Dissolved Iron	g/m3	3.8	9.5	210	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3				1.0	1.0	1.0
Dissolved Lead	g/m3	0.0049	0.00116	< 0.0002	< 0.00010	0.00012	< 0.00010
Dissolved Magnesium	g/m3	3	19.2	155	18.3	19	17.4
Dissolved Manganese	g/m3	0.43	1.78	14	0.81	0.77	0.56
Dissolved Manganese Chronic GV 95%	g/m3				1.15	1.17	1.16
Dissolved Manganese Chronic GV 90%	g/m3				1.76	1.8	1.78
Dissolved Manganese Chronic GV 80%	g/m3				2.88	2.95	2.9
Dissolved Mercury	g/m3	< 0.00010	< 0.00010	< 0.0002	< 0.00010	< 0.00010	< 0.00010

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Conf Run 1B 30 Min 06- Aug-2025 3:00 pm	R2 Man Super 4 07- Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm
Dissolved Nickel	g/m3	0.101	0.197	1.22	0.05	0.034	0.021
Dissolved Nickel Chronic GV 95%	g/m3				0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%	g/m3				0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%	g/m3				0.154	0.154	0.154
Dissolved Zinc	g/m3	0.65	1.04	7.4	0.0068	0.0069	0.0055
Dissolved Zinc Chronic GV 95%	g/m3				0.205	0.205	0.182
Dissolved Zinc Chronic GV 90%	g/m3				0.307	0.307	0.271
Dissolved Zinc Chronic GV 80%	g/m3				0.527	0.527	0.466
Dissolved Organic Carbon (DOC)	g/m3	0.7	1	1.4	1.4	1	0.9
Absorbance at 254 nm	AU cm-1	0.122	0.354	7.9	0.011	0.012	0.011
Transmittance at 254 nm	%T, 1 cm cell	75.4	44.2	< 0.5	97.6	97.3	97.6
Iron + Manganese		4.23	11.28	224	0.83	0.79	0.58
Dissolved Iron + Manganese Chronic GV 80%/90%/95%					2.15	2.17	2.16
Thallium #	g/m3	0.0028	0.0026	0.0035	0.00119	0.00113	0.00103
Sulphate	g/m3	182	570	3800	550	550	550
Potassium #	g/m3	1.52	7.1	1.22	6.8	6.9	6.6
Dissolved Sodium	g/m3	2.3 #1	3.7 #1	3.9	3.9 #1	3.8	3.8 #1
Total Sodium	g/m3	2.3 #1	3.6 #1	4.3	3.9 #1	3.9	3.7 #1
Acidity (pH 5.5)	g/m3 CaCO3						
Acidity (pH 7.0)	g/m3 CaCO3						

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Conf Run 1B 30 Min 06- Aug-2025 3:00 pm	R2 Man Super 4 07- Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm
Total Acidity (pH 8.3)	g/m3 CaCO ₃	140	360	2800	1.6	5	5
Chloride	g/m3	2.9	3.4	5.3	3.6	3.7	3.6
Nitrite-N	g/m3	< 0.002	< 0.002	< 0.02 #2	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m3	0.034	0.076	1.21	0.087	0.084	0.087
Nitrate-N + Nitrite-N	g/m3	0.034	0.076	1.23	0.087	0.084	0.087

Dissolved Metals *DOC – Dissolved Organic Carbon **EC Electrical Conductivity ##Total, as CaCO₃ ***TSS #1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

5.8 Confirmation Testing Trial August 2025 – Two Stage Flocculation Supernatant -Water Quality Results for Barren Valley ELF Water

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 16 Confirmation Testing August 2025 - Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

Supernatant Type			3 (WTP 30min 1st settled only)	4 (pH adjust, WTP 30min 2nd settling)	5 (pH adjust, Pond 24hr 2nd settling)
PF Test Number Identifier and Date Sample Sent for Analysis			Run 4 BVE Super 3 08-Aug-2025 11:45 am	Run 5 BVE Super 4 08-Aug-2025 3:30 pm	Run 6 BVE Super 5 12-Aug-2025 1:06 pm
Hills Lab Number:		3951088.10	3962556.4	3962556.5	3962556.6
Sample		BVE Raw 25-Jul-2025	BVE	BVE	BVE
Neutralent			CaO	CaO	CaO
Dose			70	72	65
Chemical makeup with previous AMD Treated Water Supernatant			Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25
Coagulant			Metalsorb	Metalsorb	Metalsorb
Flocculant			Rheomax	Rheomax	Rheomax
Sediment added					
Rapid Mix time (Neutralisation)	minutes		20	20	20
Rapid Mix time for coagulant addition	minutes		1	1	1
Rapid Mix time for flocculant addition	minutes		1	1	1
Slow Mix Time	minutes		10	10	10
Settling Time	minutes		30	30	30
Test Vessel Size			1 L	1 L	1 L
Additional pH modification			None	Sulphuric acid 1%	Sulphuric acid 1%
Amount of 1% Acid Added	mL 1%		0	0.39	0.2
Dose of 100% Sulphuric	g/m3		0	3.9	2
Slow stir time	minutes		0	10	10
Second Settling Time	hrs		0	24	24

Table 17 Supernatant Water Quality Results – Confirmation Testing August 2025 – BVE Supernatant with Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Run 4 BVE Super 3 08- Aug-2025 11:45 am	Run 5 BVE Super 4 08-Aug-2025 3:30 pm	Run 6 BVE Super 5 12-Aug-2025 1:06 pm
True Hazen Colour	Hazen units	< 10	< 10	< 10	< 10	< 10	< 10
Turbidity	NTU	11.3	23	0.39	0.75	0.2	0.14
Turbidity Target	NTU				5	5	5
pH	pH Units	3.4	3.2	2.5	7.2	6.3	6.3
pH Target	pH Units				4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3 as CaCO3	< 1.0	< 1.0	< 1.0	11	3.3	3.2
Total Hardness	g/m3 as CaCO3	87	230	1140	194	192	184
Electrical Conductivity (EC)	mS/m	50.1	104.4	455	41.5	41.4	40.4
Total Suspended Solids	g/m3	4	16	6	< 3	< 3	< 3
TSS Target					5	5	5
Total Solids (TS)	g/m3	280	860	5700	290	280	280
Dissolved Aluminium	g/m3	10.8	44 #1	270	0.072	0.054	0.035
Dissolved Aluminium Chronic GV 95%	g/m3				0.23	0.5	0.5
Dissolved Aluminium Chronic GV 90%	g/m3				0.29	0.5	0.5
Dissolved Aluminium Chronic GV 80%	g/m3				0.39	0.5	0.5
Total Aluminium	g/m3	11.4	43 #1	280	0.29	0.198	0.178
Aluminium Al3+	meq/L	1.2	4.8	31	0.008	0.0061	0.0039
Dissolved Arsenic	g/m3	< 0.0010	< 0.0010	0.178	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m3	0.00039	0.00088	0.0047	< 0.00005	0.00006	0.00013
Dissolved Cadmium Chronic GV 95%	g/m3				0.00027	0.00027	0.00026
Dissolved Cadmium Chronic GV 90%	g/m3				0.00051	0.0005	0.00048

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Run 4 BVE Super 3 08- Aug-2025 11:45 am	Run 5 BVE Super 4 08-Aug-2025 3:30 pm	Run 6 BVE Super 5 12-Aug-2025 1:06 pm
Dissolved Cadmium Chronic GV 80%	g/m3				0.00114	0.00113	0.00109
Dissolved Calcium	g/m3	30 #1	62 #1	200 #1	73	72	69
Total Calcium	g/m3	28 #1	57 #1	200 #1	74	73	73
Dissolved Chromium	g/m3	0.0011	0.0045	0.162	< 0.0005	< 0.0005	< 0.0005
Dissolved Cobalt	g/m3	0.049	0.081	0.43	0.023	0.023	0.028
Dissolved Cobalt Chronic GV 95%	g/m3				0.0024	0.0024	0.0024
Dissolved Cobalt Chronic GV 90%	g/m3				0.0058	0.0058	0.0057
Dissolved Cobalt Chronic GV 80%	g/m3				0.0155	0.0154	0.0151
Dissolved Copper	g/m3	0.021	0.0133	0.082	< 0.0005	< 0.0005	0.0006
Dissolved Copper Chronic GV 95%	g/m3				0.001	0.0009	0.0009
Dissolved Copper Chronic GV 90%	g/m3				0.0012	0.0011	0.0011
Dissolved Copper Chronic GV 80%	g/m3				0.0019	0.0018	0.0018
Dissolved Iron	g/m3	3.8	9.5	210	0.02	0.02	0.02
Dissolved Iron Chronic GV 80%/90%/95%	g/m3						
Dissolved Lead	g/m3	0.0049	0.00116	< 0.0002	< 0.00010	< 0.00010	0.00031
Dissolved Magnesium	g/m3	3	19.2	155	3	2.9	3
Dissolved Manganese	g/m3	0.43	1.78	14	0.33	0.32	0.31
Dissolved Manganese Chronic GV 95%	g/m3				0.75	0.75	0.74
Dissolved Manganese Chronic GV 90%	g/m3				1.16	1.15	1.13
Dissolved Manganese Chronic GV 80%	g/m3				1.89	1.88	1.85
Dissolved Mercury	g/m3	< 0.00010	< 0.00010	< 0.0002	< 0.00010	< 0.00010	< 0.00010

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Run 4 BVE Super 3 08- Aug-2025 11:45 am	Run 5 BVE Super 4 08-Aug-2025 3:30 pm	Run 6 BVE Super 5 12-Aug-2025 1:06 pm
Dissolved Nickel	g/m3	0.101	0.197	1.22	0.058	0.059	0.065
Dissolved Nickel Chronic GV 95%	g/m3				0.054	0.053	0.051
Dissolved Nickel Chronic GV 90%	g/m3				0.064	0.063	0.061
Dissolved Nickel Chronic GV 80%	g/m3				0.083	0.082	0.079
Dissolved Zinc	g/m3	0.65	1.04	7.4	0.025	0.071	0.171
Dissolved Zinc Chronic GV 95%	g/m3				0.039	0.076	0.073
Dissolved Zinc Chronic GV 90%	g/m3				0.058	0.113	0.109
Dissolved Zinc Chronic GV 80%	g/m3				0.099	0.194	0.187
Dissolved Organic Carbon (DOC)	g/m3	0.7	1	1.4	0.8	0.7	0.7
Absorbance at 254 nm	AU cm-1	0.122	0.354	7.9	0.01	0.007	0.009
Transmittance at 254 nm	%T, 1 cm cell	75.4	44.2	< 0.5	97.8	98.4	98
Iron + Manganese		4.23	11.28	224	0.35	0.34	0.33
Dissolved Iron + Manganese Chronic GV 80%/90%/95%					1.75	1.75	1.74
Thallium #	g/m3	0.0028	0.0026	0.0035	0.0021	0.0021	0.0021
Sulphate	g/m3	182	570	3800	182	183	185
Potassium #	g/m3	1.52	7.1	1.22	1.48	1.51	1.55
Dissolved Sodium	g/m3	2.3 #1	3.7 #1	3.9	2.4	2.4 #1	2.4 #1
Total Sodium	g/m3	2.3 #1	3.6 #1	4.3	2.4	2.3 #1	2.4 #1
Acidity (pH 5.5)	g/m3 CaCO3						
Acidity (pH 7.0)	g/m3 CaCO3						

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul- 2025	Run 4 BVE Super 3 08- Aug-2025 11:45 am	Run 5 BVE Super 4 08-Aug-2025 3:30 pm	Run 6 BVE Super 5 12-Aug-2025 1:06 pm
Total Acidity (pH 8.3)	g/m3 CaCO ₃	140	360	2800	1.2	4	3
Chloride	g/m3	2.9	3.4	5.3	3.2	3.1	3.1
Nitrite-N	g/m3	< 0.002	< 0.002	< 0.02 #2	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m3	0.034	0.076	1.21	0.039	0.039	0.04
Nitrate-N + Nitrite-N	g/m3	0.034	0.076	1.23	0.039	0.04	0.04

Dissolved Metals *DOC – Dissolved Organic Carbon **EC Electrical Conductivity ##Total, as CaCO₃ ***TSS #1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

5.9 Confirmation Testing Trial August 2025 – Two Stage Flocculation Supernatant -Water Quality Results for S23 Water

Note: Fe Hills Result 0.02 has been put in table instead of <0.02 to allow Iron + Mang addition

Results that exceed the modified GV are shown in orange.

Table 18 Confirmation Testing August 2025 - Supernatant Process Parameters for Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

Supernatant Type			3 (WTP 30min 1st settled only)	4 (pH adjust, WTP 30min 2nd settling)	5 (pH adjust, Pond 24hr 2nd settling)
PF Test Number Identifier and Date Sample Sent for Analysis			Run 7 S23 Super 3 12-Aug-2025 12:30 pm	Run 8 S23 Super 4 13-Aug-2025 11:40 am	Run 9 S23 Super 5 14-Aug-2025 1:34 pm
Hills Lab Number:		3951088.30	3962556.7	3962556.8	3962556.9
Sample		S23 Raw 25-Jul-2025	S23	S23	S23
Neutralent			CaO	CaO	CaO
Dose	g/m3		1601	1632	1664
Chemical makeup with previous AMD Treated Water Supernatant			Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25	Barrel Test T2 Manchester 30/1/25
Coagulant			Metalsorb	Metalsorb	Metalsorb
Flocculant			Rheomax	Rheomax	Rheomax
Sediment added			3g	3g	3g
Rapid Mix time (Neutralisation)	minutes		20	20	20
Rapid Mix time for coagulant addition	minutes		1	1	1
Rapid Mix time for flocculant addition	minutes		1	1	1
Slow Mix Time	minutes		10	10	10
Settling Time	minutes		30	30	30
Test Vessel Size			1 L	1 L	1 L
Additional pH modification			None	Sulphuric acid 1%	Sulphuric acid 1%
Amount of 1% Acid Added	mL 1%		0	0.17	0.24
Dose of 100% Sulphuric	g/m3		0	1.7	2.4
Slow stir time	minutes		0	10	10
Second Settling Time	hrs		0	24	24

Table 19 Supernatant Water Quality Results – Confirmation Testing August 2025 – S23 Supernatant with Neutralisation, Coagulation, Flocculation, pH adjustment and Settling

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25- Jul-2025	S23 Raw 25-Jul- 2025	Run 7 S23 Super 3 12- Aug-2025 12:30 pm	Run 8 S23 Super 4 13-Aug-2025 11:40 am	Run 9 S23 Super 5 14-Aug-2025 1:34 pm
True Hazen Colour	Hazen units	< 10	< 10	< 10	< 10	< 10	< 10
Turbidity	NTU	11.3	23	0.39	0.84	0.82	1.25
Turbidity Target	NTU				5	5	5
pH	pH	3.4	3.2	2.5	6.4	6.3	7
pH Target	pH				4.5-7	4.5-7	4.5-7
Total Alkalinity	g/m3*	< 1.0	< 1.0	< 1.0	5.2	4.7	6.2
Total Hardness	g/m3*	87	230	1140	3200	3200	3200
Electrical Conductivity (EC)	mS/m	50.1	104.4	455	416	415	414
Total Suspended Solids	g/m3	4	16	6	130	158	51
TSS Target	g/m3						
Total Solids (TS)	g/m3	280	860	5700	4600	4600	4300
Dissolved Aluminium	g/m3	10.8	44 #1	270	0.21	0.24	0.191
Dissolved Aluminium Chronic GV 95%	g/m3				0.5	0.5	0.25
Dissolved Aluminium Chronic GV 90%	g/m3				0.5	0.5	0.32
Dissolved Aluminium Chronic GV 80%	g/m3				0.5	0.5	0.43
Total Aluminium	g/m3	11.4	43 #1	280	0.9	0.67	0.58
Aluminium Al3+	meq/L	1.2	4.8	31	0.023	0.027	0.021
Dissolved Arsenic	g/m3	< 0.0010	< 0.0010	0.178	< 0.005	< 0.005	< 0.005
Dissolved Cadmium	g/m3	0.00039	0.00088	0.0047	< 0.0003	< 0.0003	< 0.0003
Dissolved Cadmium Chronic GV 95%	g/m3				0.00037	0.00037	0.00037
Dissolved Cadmium Chronic GV 90%	g/m3				0.00069	0.00069	0.00069

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25- Jul-2025	S23 Raw 25-Jul- 2025	Run 7 S23 Super 3 12- Aug-2025 12:30 pm	Run 8 S23 Super 4 13-Aug-2025 11:40 am	Run 9 S23 Super 5 14-Aug-2025 1:34 pm
Dissolved Cadmium Chronic GV 80%	g/m3				0.00155	0.00155	0.00155
Dissolved Calcium	g/m3	30 #1	62 #1	200 #1	1050	1040	1040
Total Calcium	g/m3	28 #1	57 #1	200 #1	1150	1110	1110
Dissolved Chromium	g/m3	0.0011	0.0045	0.162	0.004	0.004	0.004
Dissolved Cobalt	g/m3	0.049	0.081	0.43	0.0065	0.0135	0.021
Dissolved Cobalt Chronic GV 95%	g/m3				0.0033	0.0033	0.0033
Dissolved Cobalt Chronic GV 90%	g/m3				0.0078	0.0078	0.0078
Dissolved Cobalt Chronic GV 80%	g/m3				0.0208	0.0208	0.0208
Dissolved Copper	g/m3	0.021	0.0133	0.082	< 0.003	< 0.003	< 0.003
Dissolved Copper Chronic GV 95%	g/m3				0.0012	0.0013	0.0013
Dissolved Copper Chronic GV 90%	g/m3				0.0014	0.0015	0.0015
Dissolved Copper Chronic GV 80%	g/m3				0.0023	0.0024	0.0024
Dissolved Iron	g/m3	3.8	9.5	210	0.1	0.1	0.1
Dissolved Iron Chronic GV 80%/90%/95%	g/m3				1	1	1
Dissolved Lead	g/m3	0.0049	0.00116	< 0.0002	< 0.0005	< 0.0005	< 0.0005
Dissolved Magnesium	g/m3	3	19.2	155	141	151	152
Dissolved Manganese	g/m3	0.43	1.78	14	1.36	2.3	3.1
Dissolved Manganese Chronic GV 95%	g/m3				1.25	1.25	1.25
Dissolved Manganese Chronic GV 90%	g/m3				1.93	1.93	1.93
Dissolved Manganese Chronic GV 80%	g/m3				3.15	3.15	3.15
Dissolved Mercury	g/m3	< 0.00010	< 0.00010	< 0.0002	< 0.00010	< 0.00010	< 0.00010

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25- Jul-2025	S23 Raw 25-Jul- 2025	Run 7 S23 Super 3 12- Aug-2025 12:30 pm	Run 8 S23 Super 4 13-Aug-2025 11:40 am	Run 9 S23 Super 5 14-Aug-2025 1:34 pm
Dissolved Nickel	g/m3	0.101	0.197	1.22	0.025	0.049	0.073
Dissolved Nickel Chronic GV 95%					0.099	0.099	0.099
Dissolved Nickel Chronic GV 90%					0.118	0.118	0.118
Dissolved Nickel Chronic GV 80%					0.154	0.154	0.154
Dissolved Zinc	g/m3	0.65	1.04	7.4	0.014	0.013	< 0.005
Dissolved Zinc Chronic GV 95%					0.161	0.181	0.197
Dissolved Zinc Chronic GV 90%					0.24	0.271	0.294
Dissolved Zinc Chronic GV 80%					0.412	0.465	0.504
Dissolved Organic Carbon (DOC)	g/m3	0.7	1	1.4	1	1.1	1.1
Absorbance at 254 nm	AU cm-1	0.122	0.354	7.9	0.019	0.018	0.017
Transmittance at 254 nm	%T, 1 cm cell	75.4	44.2	< 0.5	95.7	96	96.1
Iron + Manganese		4.23	11.28	224	1.46	2.4	3.2
Dissolved Iron + Manganese Chronic GV 80%/90%/95%					2.25	2.25	2.25
Thallium #	g/m3	0.0028	0.0026	0.0035	0.0019	0.002	0.0021
Sulphate	g/m3	182	570	3800	2500	2600	2800
Potassium #	g/m3	1.52	7.1	1.22	1.5	1.5	1.6
Dissolved Sodium	g/m3	2.3 #1	3.7 #1	3.9	4.6	4.6	4.6 #1
Total Sodium	g/m3	2.3 #1	3.6 #1	4.3	4.6	4.7	4.5 #1
Acidity (pH 5.5)	g/m3 CaCO3						
Acidity (pH 7.0)	g/m3 CaCO3						

PF Test Number Identifier and Date Sample Sent for Analysis		BVE Raw 25-Jul- 2025	Manchester Raw 25- Jul-2025	S23 Raw 25-Jul- 2025	Run 7 S23 Super 3 12- Aug-2025 12:30 pm	Run 8 S23 Super 4 13-Aug-2025 11:40 am	Run 9 S23 Super 5 14-Aug-2025 1:34 pm
Total Acidity (pH 8.3)	g/m3 CaCO ₃	140	360	2800	6	6	3
Chloride	g/m3	2.9	3.4	5.3	5.1	5.1	5.4
Nitrite-N	g/m3	< 0.002	< 0.002	< 0.02 #2	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m3	0.034	0.076	1.21	1.01	1.01	1.03
Nitrate-N + Nitrite-N	g/m3	0.034	0.076	1.23			

Dissolved Metals *DOC – Dissolved Organic Carbon **EC Electrical Conductivity ##Total, as CaCO₃ ***TSS #1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

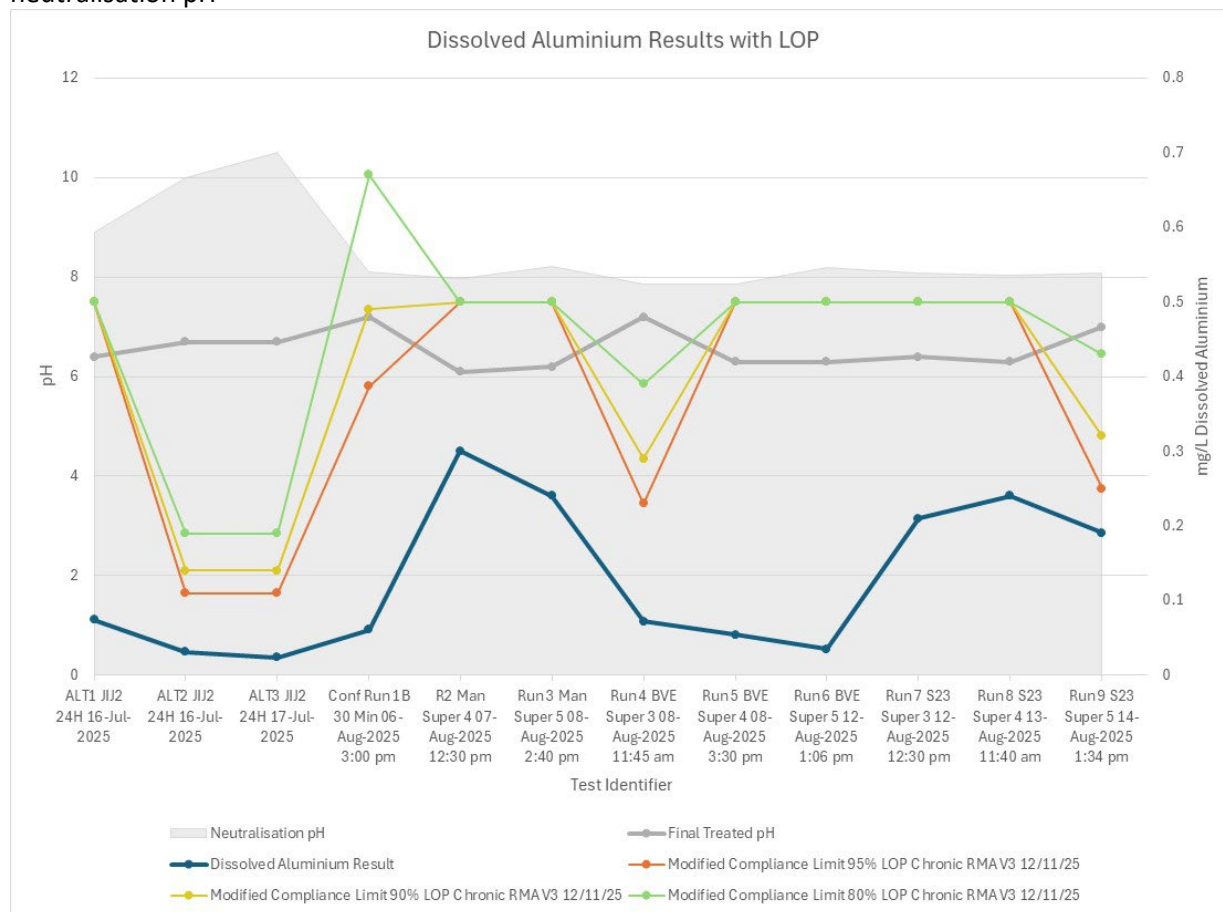
6 GRAPHS OF DISSOLVED METALS COMPARED WITH GUIDELINE VALUE LOPS AND PH

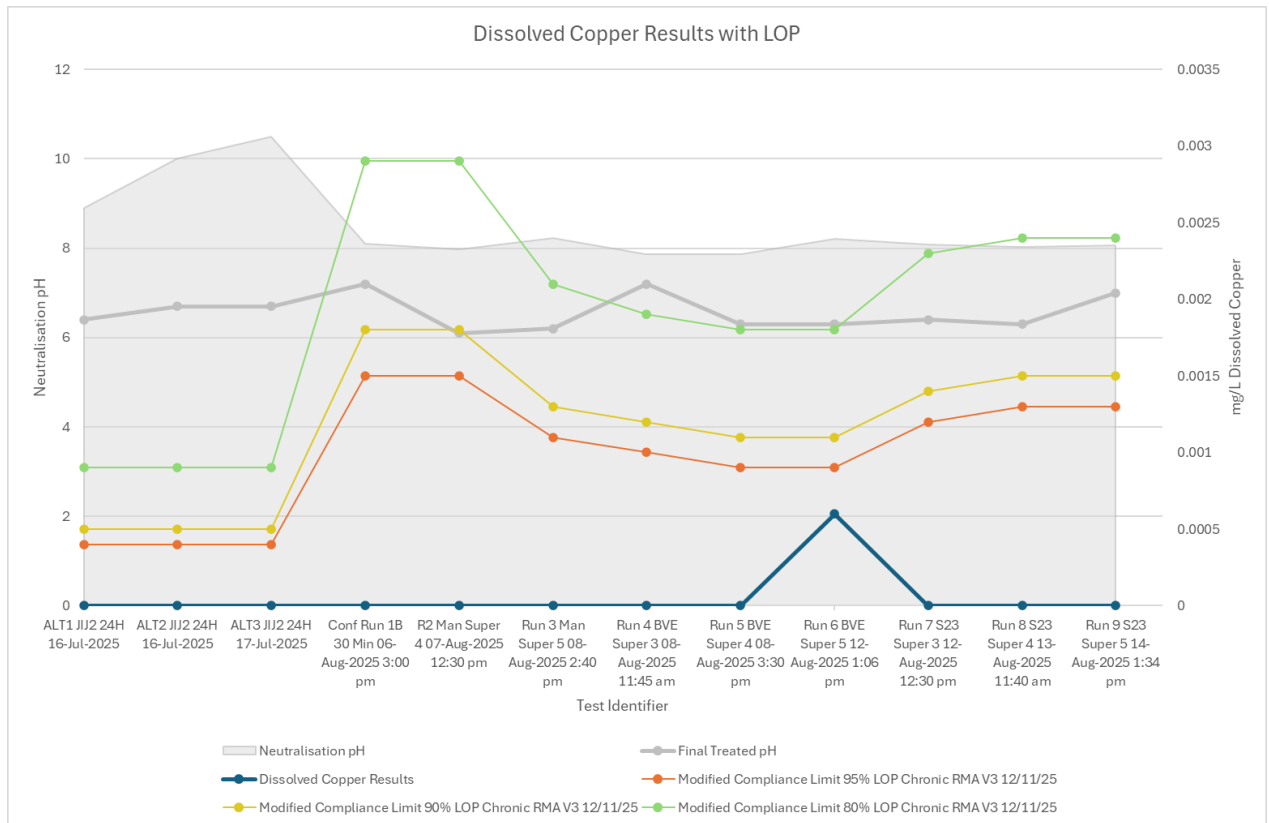
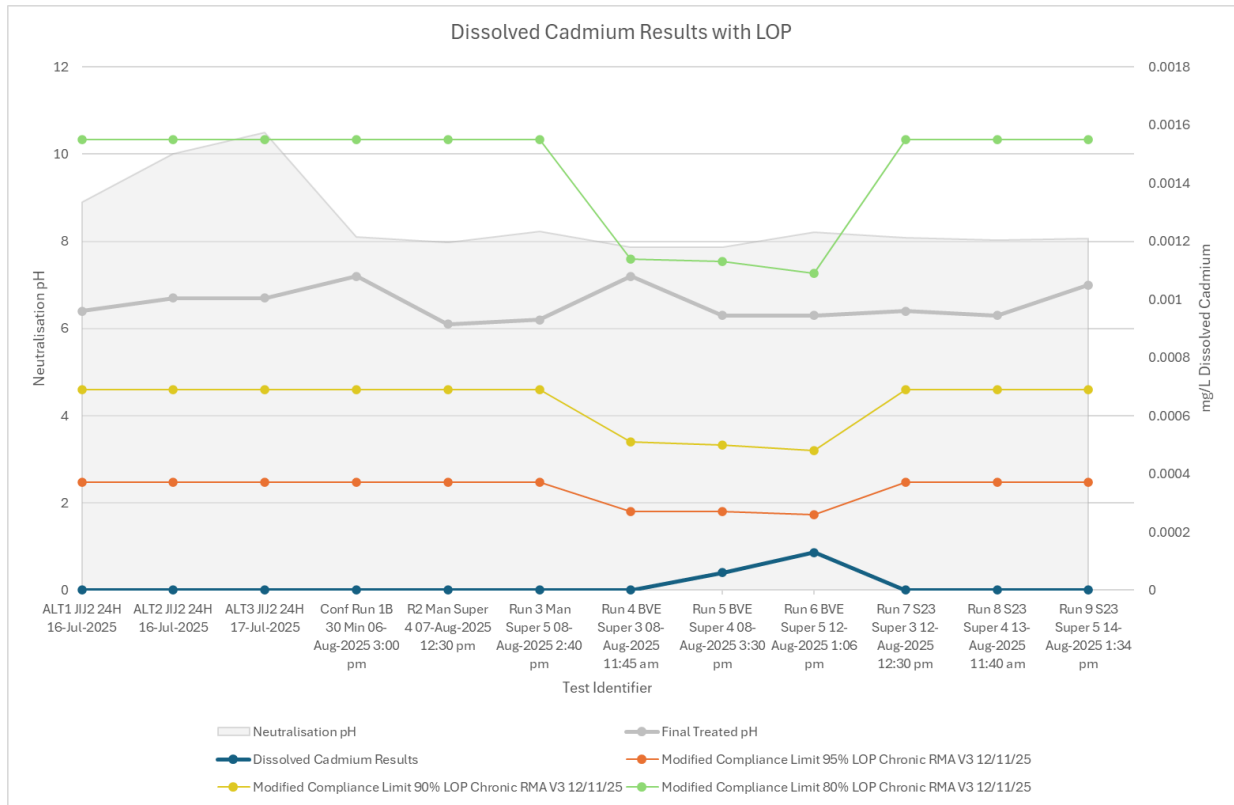
Below are the graphed results of the Aluminium removal and Confirmation testing compared with the Guideline Values.

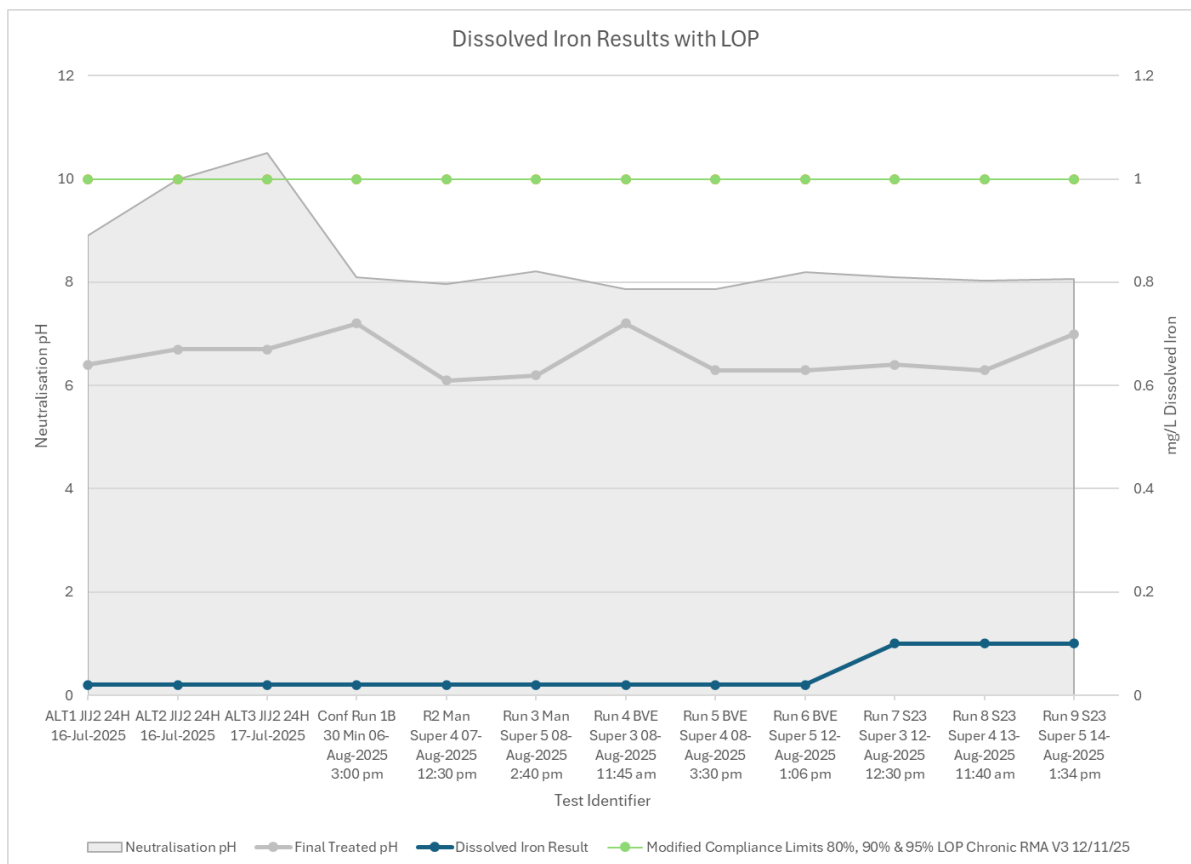
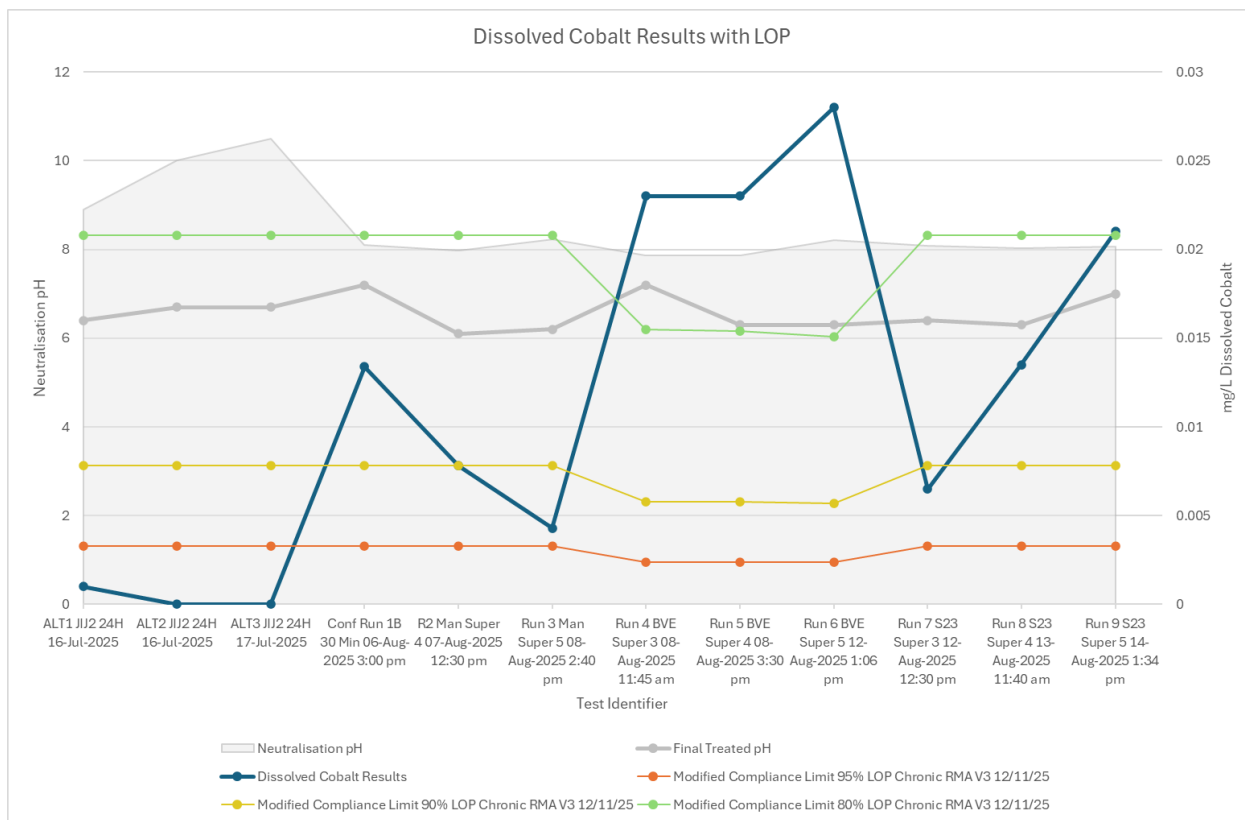
The graphs show the results of the treated water dissolved metals, neutralisation pH and final treated water pH from the three water qualities: Manchester St, Barren Valley Elf and S23 samples.

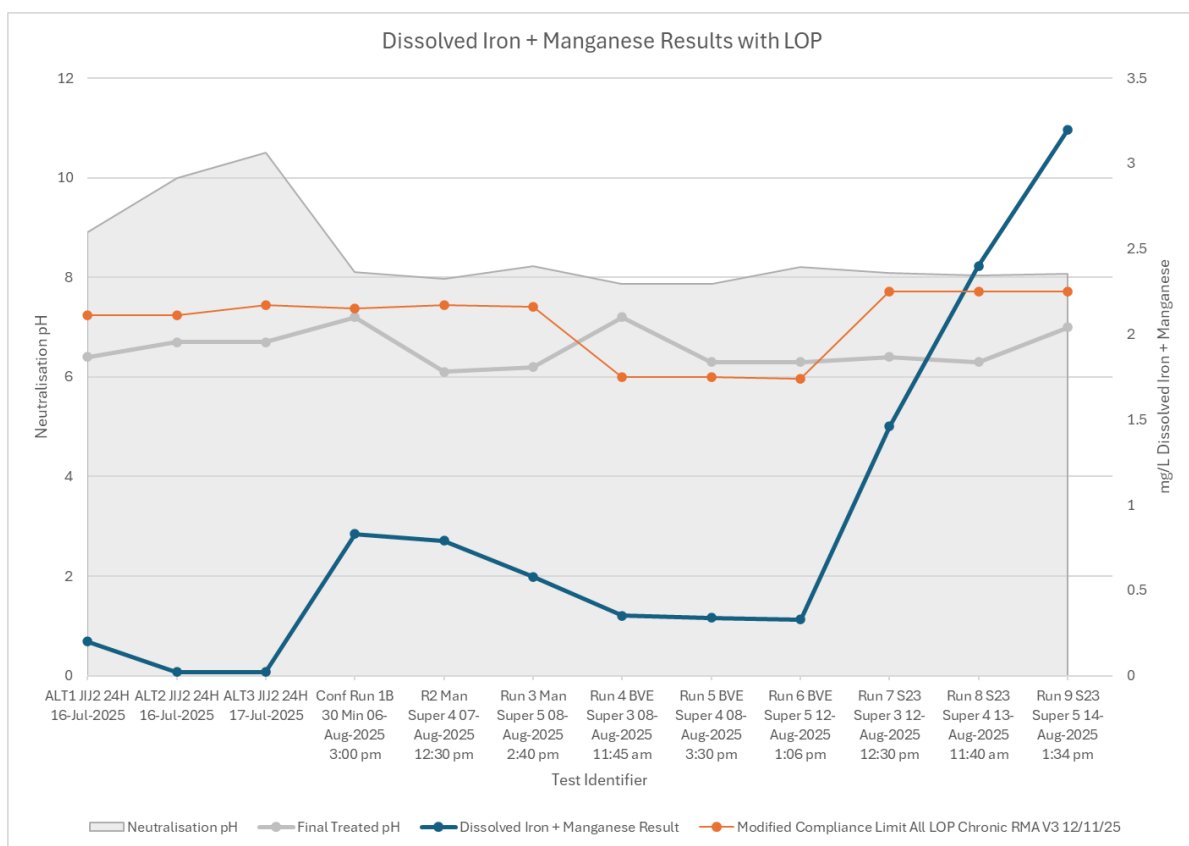
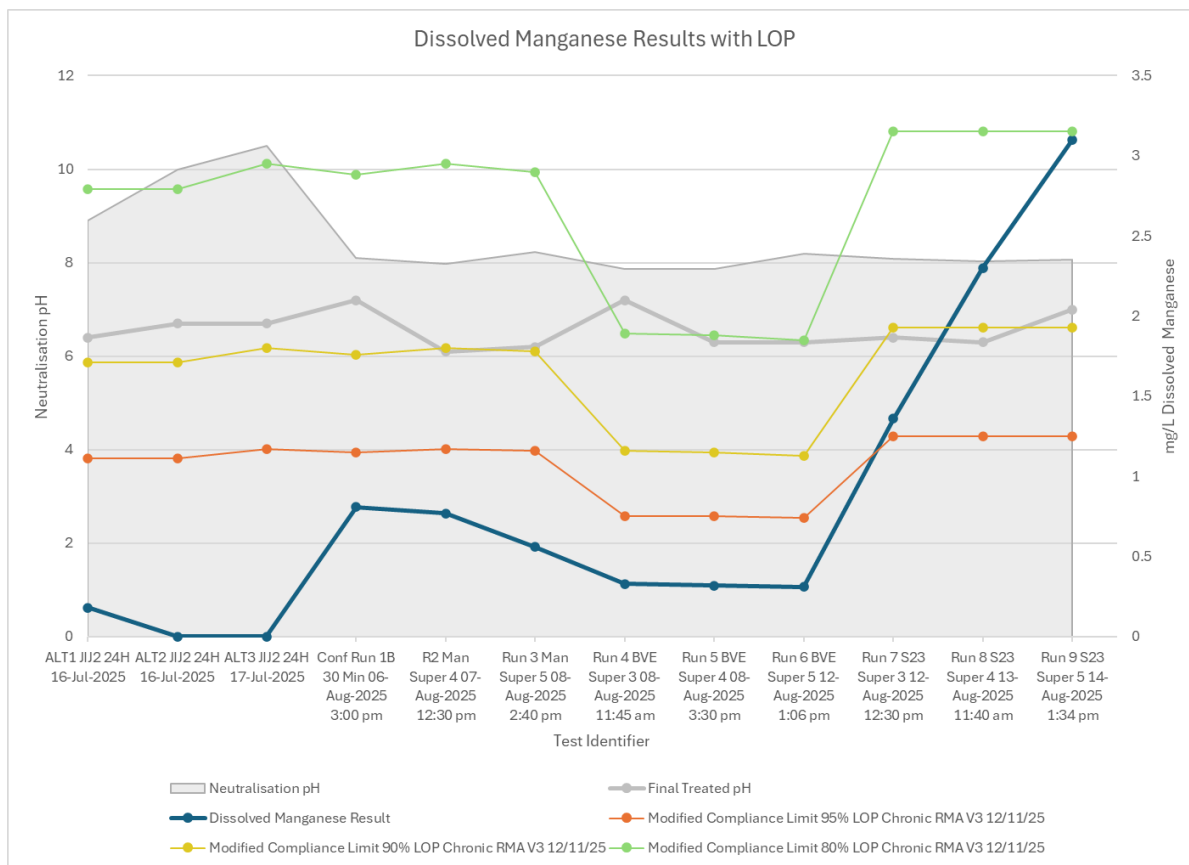
The graphs are separated into results for each dissolved metal parameter which has compliance limits, (Aluminium, Cadmium, Cobalt, Copper, Iron, Manganese, Nickel, Zinc and Iron+Manganese combined) and then compared to the limits of Modified Compliance Limits of 95%, 90% and 80% LOP.

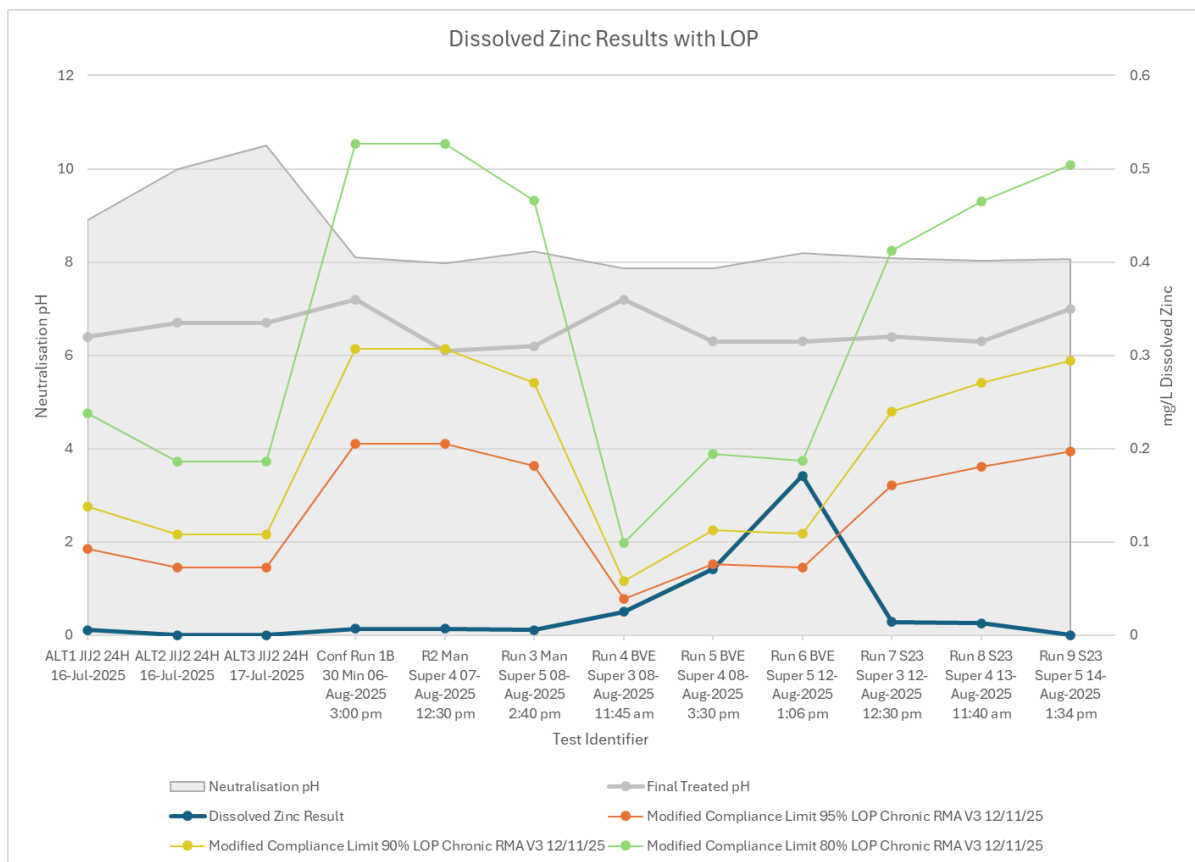
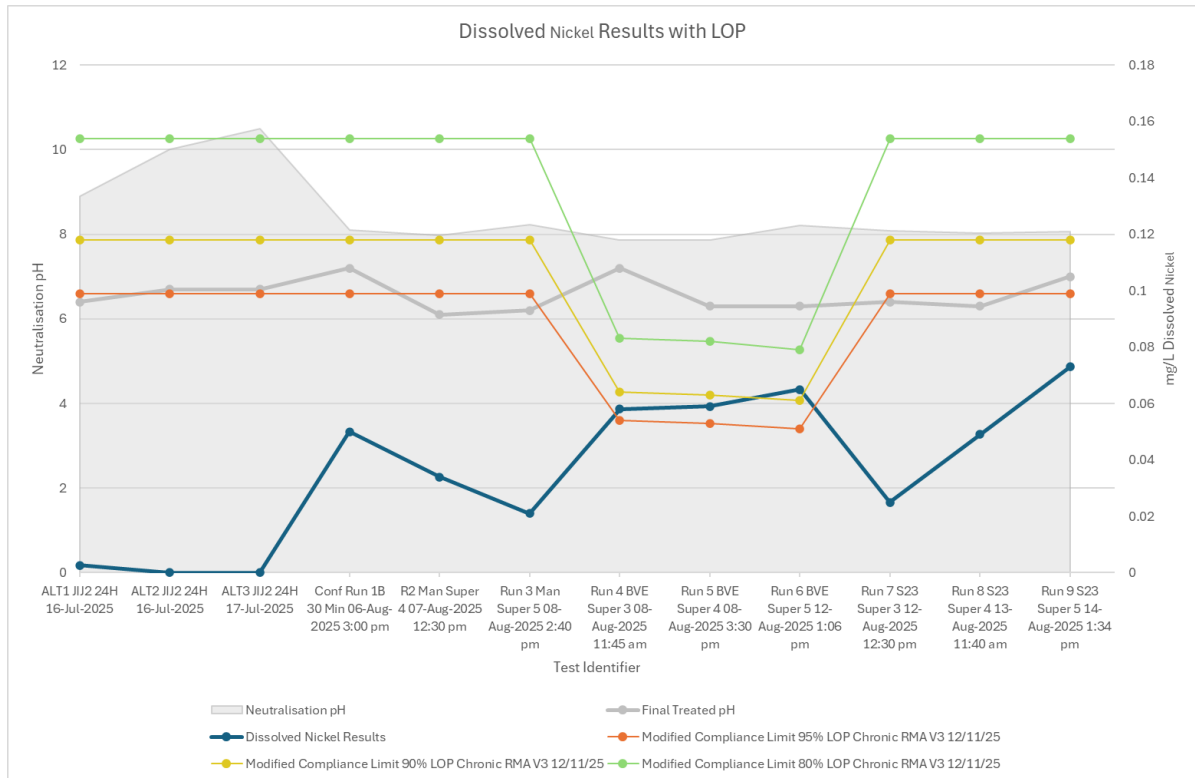
The pH values for the neutralisation phase of treatment and the final treated pH are also shown. It is noted that the tests with the higher neutralisation pH are showing better overall metals removal, particularly for cobalt where the Modified Compliance Limit is not met for the Cobalt with lower neutralisation pH











APPENDIX A –WATER QUALITY LABORATORY RESULTS

Hill Laboratory Report References:

3942629-SP-2 Aluminium Removal Testing Using Barrel Supernatant

3951088-SP-2 Stockton Raw August 2025

3962556-SP-1 Stockton Confirmation Supernatant Results

Sample Type: Aqueous

Sample Name:		ALT1 JIJ2 24H 16-Jul-2025	ALT2 JIJ2 24H 16-Jul-2025	ALT3 JIJ2 24H 17-Jul-2025
Lab Number:		3942629.1	3942629.2	3942629.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	0.31	0.30	0.16
pH	pH Units	6.4	6.7	6.7
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	2.5	1.9	2.2
Total Alkalinity	g/m ³ as CaCO ₃	5.5	6.0	6.9
Total Hardness	g/m ³ as CaCO ₃	500	500	570
Electrical Conductivity (EC)	mS/m	95.5	95.7	105.1
Total Suspended Solids	g/m ³	< 3	< 5 #1	< 3
Dissolved Aluminium	g/m ³	0.074	0.031	0.024
Total Aluminium	g/m ³	0.172	0.65	0.66
Aluminium Al ³⁺	meq/L	0.0082	0.0035	0.0026
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005
Dissolved Calcium	g/m ³	178	200	230 #2
Total Calcium	g/m ³	184	200	230 #2
Dissolved Chromium	g/m ³	0.0011	0.0012	0.0014
Dissolved Cobalt	g/m ³	0.0010	< 0.0002	< 0.0002
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	13.3	0.69	0.10
Dissolved Manganese	g/m ³	0.180	0.0009	0.0008
Dissolved Mercury	g/m ³	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	0.0027	< 0.0005	< 0.0005
Dissolved Potassium	g/m ³	8.3	8.0	8.2
Dissolved Sodium	g/m ³	3.8	3.9	3.9 #2
Total Sodium	g/m ³	3.9	4.0	3.9 #2
Dissolved Thallium	g/m ³	0.00117	0.00068	0.00058
Dissolved Zinc	g/m ³	0.0058	< 0.0010	< 0.0010
Chloride	g/m ³	3.6	3.4	3.5
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	< 0.002	0.014	0.010
Nitrate-N + Nitrite-N	g/m ³	< 0.002	0.015	0.011
Sulphate	g/m ³	520	520	560
Dissolved Organic Carbon (DOC)	g/m ³	< 0.5	< 0.5	< 0.5
Absorbance at 254 nm	AU cm ⁻¹	0.004	0.004	0.005
Transmittance at 254 nm*	%T, 1 cm cell	99.0	99.2	98.9



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Analyst's Comments

#1 There was insufficient sample to filter the usual amount for the Total Suspended Solids test so the detection limit is higher than normal.

#2 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

Amended Report: This certificate of analysis replaces report '3942629-SPv1' issued on 28-Jul-2025 at 4:11 pm.
Reason for amendment: Additional testing added, at the request of the client.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - HCl	Sample filtration through 0.45µm membrane filter and preservation with nitric and hydrochloric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0032 g/m ³	1-3
Aluminium Al ³⁺⁺	Calculation; Aluminium (in mg/L) x 3 / 26.98. APHA 1050 A : Online Edition.	0.0004 meq/L	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m ³	1-3

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Thallium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-3
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-3
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 22-Jul-2025 and 01-Aug-2025. 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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.



Sample Type: Aqueous

Sample Name:		BVE Raw 25-Jul-2025	Manchester Raw 25-Jul-2025	S23 Raw 25-Jul-2025
Lab Number:		3951088.1	3951088.2	3951088.3
True Hazen Colour	Hazen units	< 10	< 10	< 10
Turbidity	NTU	11.3	23	0.39
pH	pH Units	3.4	3.2	2.5
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	140	360	2,800
Total Alkalinity	g/m ³ as CaCO ₃	< 1.0	< 1.0	< 1.0
Total Hardness	g/m ³ as CaCO ₃	87	230	1,140
Electrical Conductivity (EC)	mS/m	50.1	104.4	455
Total Suspended Solids	g/m ³	4	16	6
Total Solids (TS)	g/m ³	280	860	5,700
Dissolved Aluminium	g/m ³	10.8	44 #1	270
Total Aluminium	g/m ³	11.4	43 #1	280
Aluminium Al ³⁺ **	meq/L	1.20	4.8	31
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	0.178
Dissolved Cadmium	g/m ³	0.00039	0.00088	0.0047
Dissolved Calcium	g/m ³	30 #1	62 #1	200 #1
Total Calcium	g/m ³	28 #1	57 #1	200 #1
Dissolved Chromium	g/m ³	0.0011	0.0045	0.162
Dissolved Cobalt	g/m ³	0.049	0.081	0.43
Dissolved Copper	g/m ³	0.021	0.0133	0.082
Dissolved Iron	g/m ³	3.8	9.5	210
Dissolved Lead	g/m ³	0.0049	0.00116	< 0.0002
Dissolved Magnesium	g/m ³	3.0	19.2	155
Dissolved Manganese	g/m ³	0.43	1.78	14.0
Dissolved Mercury	g/m ³	< 0.00010	< 0.00010	< 0.0002
Dissolved Nickel	g/m ³	0.101	0.197	1.22
Dissolved Potassium	g/m ³	1.52	7.1	1.22
Dissolved Sodium	g/m ³	2.3 #1	3.7 #1	3.9
Total Sodium	g/m ³	2.3 #1	3.6 #1	4.3
Dissolved Thallium	g/m ³	0.0028	0.0026	0.0035
Dissolved Zinc	g/m ³	0.65	1.04	7.4
Chloride	g/m ³	2.9	3.4	5.3
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.02 #2
Nitrate-N	g/m ³	0.034	0.076	1.21
Nitrate-N + Nitrite-N	g/m ³	0.034	0.076	1.23
Sulphate	g/m ³	182	570	3,800
Dissolved Organic Carbon (DOC)	g/m ³	0.7	1.0	1.4
Absorbance at 254 nm	AU cm ⁻¹	0.122	0.354	7.90
Transmittance at 254 nm*	%T, 1 cm cell	75.4	44.2	< 0.5



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Analyst's Comments

#1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

#2 Severe matrix interferences required that a dilution be performed prior to analysis, resulting in a detection limit higher than that normally achieved for the NO₂N analysis.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-3
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-3
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-3
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-3
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-2
Total Solids (TS)	Gravimetric. APHA 2540 B (modified) : Online Edition.	10 g/m ³	3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-3
Filtration for dissolved metals analysis - HCl	Sample filtration through 0.45µm membrane filter and preservation with nitric and hydrochloric acid. APHA 3030 B : Online Edition.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-3
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0032 g/m ³	1-3
Aluminium Al ³⁺ **	Calculation; Aluminium (in mg/L) x 3 / 26.98. APHA 1050 A : Online Edition.	0.0004 meq/L	1-3
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m ³	1-3
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-3
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Mercury	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-3
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-3
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-3
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-3
Dissolved Thallium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-3
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-3
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-3
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-3
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-3
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-3
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-3
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-3

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

Testing was completed between 01-Aug-2025 and 11-Aug-2025. 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.

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Sample Type: Aqueous

Sample Name:		Conf Run 1B 30 Min 06-Aug-2025 3:00 pm	R2 Man Super 4 07-Aug-2025 12:30 pm	Run 3 Man Super 5 08-Aug-2025 2:40 pm	Run 4 BVE Super 3 08-Aug-2025 11:45 am	Run 5 BVE Super 4 08-Aug-2025 3:30 pm
Lab Number:		3962556.1	3962556.2	3962556.3	3962556.4	3962556.5
True Hazen Colour	Hazen units	< 10	< 10	< 10	< 10	< 10
Turbidity	NTU	0.75	0.11	0.31	0.75	0.20
pH	pH Units	7.2	6.1	6.2	7.2	6.3
Total Acidity (pH 8.3)	g/m ³ as CaCO ₃	1.6	5	5	1.2	4
Total Alkalinity	g/m ³ as CaCO ₃	7.6	3.2	3.7	11.0	3.3
Total Hardness	g/m ³ as CaCO ₃	540	570	550	194	192
Electrical Conductivity (EC)	mS/m	100.3	100.5	100.9	41.5	41.4
Total Suspended Solids	g/m ³	< 3	< 3	< 3	< 3	< 3
Total Solids (TS)	g/m ³	820	810	830	290	280
Dissolved Aluminium	g/m ³	0.061	0.30	0.24	0.072	0.054
Total Aluminium	g/m ³	0.41	0.31	0.47	0.29	0.198
Aluminium Al ³⁺ **	meq/L	0.0068	0.033	0.027	0.0080	0.0061
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00006
Dissolved Calcium	g/m ³	187	199 #1	191 #1	73	72
Total Calcium	g/m ³	192	194 #1	189 #1	74	73
Dissolved Chromium	g/m ³	0.0008	0.0008	0.0008	< 0.0005	< 0.0005
Dissolved Cobalt	g/m ³	0.0134	0.0078	0.0043	0.023	0.023
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead	g/m ³	< 0.00010	0.00012	< 0.00010	< 0.00010	< 0.00010
Dissolved Magnesium	g/m ³	18.3	19.0	17.4	3.0	2.9
Dissolved Manganese	g/m ³	0.81	0.77	0.56	0.33	0.32
Dissolved Mercury	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	0.050	0.034	0.021	0.058	0.059
Dissolved Potassium	g/m ³	6.8	6.9	6.6	1.48	1.51
Dissolved Sodium	g/m ³	3.9 #1	3.8	3.8 #1	2.4	2.4 #1
Total Sodium	g/m ³	3.9 #1	3.9	3.7 #1	2.4	2.3 #1
Dissolved Thallium	g/m ³	0.00119	0.00113	0.00103	0.0021	0.0021
Dissolved Zinc	g/m ³	0.0068	0.0069	0.0055	0.025	0.071
Chloride	g/m ³	3.6	3.7	3.6	3.2	3.1
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	0.087	0.084	0.087	0.039	0.039
Nitrate-N + Nitrite-N	g/m ³	0.087	0.084	0.087	0.039	0.040
Sulphate	g/m ³	550	550	550	182	183
Dissolved Organic Carbon (DOC)	g/m ³	1.4	1.0	0.9	0.8	0.7
Absorbance at 254 nm	AU cm ⁻¹	0.011	0.012	0.011	0.010	0.007
Transmittance at 254 nm*	%T, 1 cm cell	97.6	97.3	97.6	97.8	98.4



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous					
Sample Name:		Run 6 BVE Super 5 12-Aug-2025 1:06 pm	Run 7 S23 Super 3 12-Aug-2025 12:30 pm	Run 8 S23 Super 4 13-Aug-2025 11:40 am	Run 9 S23 Super 5 14-Aug-2025 1:34 pm
Lab Number:		3962556.6	3962556.7	3962556.8	3962556.9
True Hazen Colour	Hazen units	< 10	< 10	< 10	< 10
Turbidity	NTU	0.14	0.84	0.82	1.25
pH	pH Units	6.3	6.4	6.3	7.0
Total Acidity (pH 8.3)	g/m³ as CaCO₃	3	6	6	3
Total Alkalinity	g/m³ as CaCO₃	3.2	5.2	4.7	6.2
Total Hardness	g/m³ as CaCO₃	184	3,200	3,200	3,200
Electrical Conductivity (EC)	mS/m	40.4	416	415	414
Total Suspended Solids	g/m³	< 3	130	158	51
Total Solids (TS)	g/m³	280	4,600	4,600	4,300
Dissolved Aluminium	g/m³	0.035	0.21	0.24	0.191
Total Aluminium	g/m³	0.178	0.90	0.67	0.58
Aluminium Al³⁺*	meq/L	0.0039	0.023	0.027	0.021
Dissolved Arsenic	g/m³	< 0.0010	< 0.005	< 0.005	< 0.005
Dissolved Cadmium	g/m³	0.00013	< 0.0003	< 0.0003	< 0.0003
Dissolved Calcium	g/m³	69	1,050	1,040	1,040
Total Calcium	g/m³	73	1,150	1,110	1,110
Dissolved Chromium	g/m³	< 0.0005	0.004	0.004	0.004
Dissolved Cobalt	g/m³	0.028	0.0065	0.0135	0.021
Dissolved Copper	g/m³	0.0006	< 0.003	< 0.003	< 0.003
Dissolved Iron	g/m³	< 0.02	< 0.10	< 0.10	< 0.10
Dissolved Lead	g/m³	0.00031	< 0.0005	< 0.0005	< 0.0005
Dissolved Magnesium	g/m³	3.0	141	151	152
Dissolved Manganese	g/m³	0.31	1.36	2.3	3.1
Dissolved Mercury	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	0.065	0.025	0.049	0.073
Dissolved Potassium	g/m³	1.55	1.5	1.5	1.6
Dissolved Sodium	g/m³	2.4 #1	4.6	4.6	4.6 #1
Total Sodium	g/m³	2.4 #1	4.6	4.7	4.5 #1
Dissolved Thallium	g/m³	0.0021	0.0019	0.0020	0.0021
Dissolved Zinc	g/m³	0.171	0.014	0.013	< 0.005
Chloride	g/m³	3.1	5.1	5.1	5.4
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m³	0.040	1.01	1.01	1.03
Nitrate-N + Nitrite-N	g/m³	0.040	1.01	1.01	1.03
Sulphate	g/m³	185	2,500	2,600	2,800
Dissolved Organic Carbon (DOC)	g/m³	0.7	1.0	1.1	1.1
Absorbance at 254 nm	AU cm⁻¹	0.009	0.019	0.018	0.017
Transmittance at 254 nm*	%T, 1 cm cell	98.0	95.7	96.0	96.1

Analyst's Comments

#1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

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 Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1-9
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-9
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-9
True Hazen Colour	Filtered sample. Spectrophotometry. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2120 C (modified) : Online Edition.	10 Hazen units	1-9

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2130 B (modified) : Online Edition.	0.05 NTU	1-9
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-9
Total Acidity (pH 8.3)	Titration to pH 8.3 with standard sodium hydroxide solution, phenolphthalein indicator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2310 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-9
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-9
Total Hardness	Calculation from Dissolved Calcium and Dissolved Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-9
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-9
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5 µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 D (modified) : Online Edition.	3 g/m ³	1-9
Total Solids (TS)	Gravimetric. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2540 B (modified) : Online Edition.	10 g/m ³	1-9
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-9
Filtration for dissolved metals analysis - HCl	Sample filtration through 0.45µm membrane filter and preservation with nitric and hydrochloric acid. APHA 3030 B : Online Edition.	-	1-9
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-9
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0032 g/m ³	1-9
Aluminium Al ³⁺⁺	Calculation; Aluminium (in mg/L) x 3 / 26.98. APHA 1050 A : Online Edition.	0.0004 meq/L	1-9
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-9
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-9
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-9
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m ³	1-9
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-9
Dissolved Cobalt	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0002 g/m ³	1-9
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-9
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-9
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-9
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-9
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-9
Dissolved Mercury	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m ³	1-9
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-9
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-9

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-9
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-9
Dissolved Thallium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 g/m ³	1-9
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m ³	1-9
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-9
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-9
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-9
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-9
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-9
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m ³	1-9
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm ⁻¹	1-9
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1-9

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

Testing was completed between 15-Aug-2025 and 22-Aug-2025. 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.

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APPENDIX B – CONFIRMATION TESTING IN-HOUSE RESULTS

	Test		Run 0			Notes
	Description		Pre-Test chem dosing			
	Sample		BVE	MAN	S23	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		1.08.2025	1.08.2025	1.08.2025	
	Time		9.30am-1.30pm	9.30am-1.30pm	9.30am-1.30pm	
	Raw Water pH	pH	3.05-3.21	2.8-3.16	2.2-2.55	
	Raw Water UVT	%	64.2/65.0	28.3/29.5	-0.2/-0.2	
	Raw Water Turbidity	NTU	8.12/7.59	40.36/36.54	0.63/7.41/1.64/0.68/0.82	
(remember to dilute for Raw water)	In house Aluminium		8.82	40	254.25	
(remember to dilute for Raw water)	In house Iron		5.1	12.03	187.2	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		check CaO dose	check CaO dose	check CaO dose	
	Concentration of slurry	%	20	20	20	
	Slurry amount	mL	[prev0.35-0.4] 0.6	1.3	[prev4.5] 9.5	
	Neutralent Dose	mg/L	120	260	1900	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	30	30	30	
	Adjusted pH	pH	9.05	8.52	7.95	
Coagulant /Chelant Addition	Coagulation/Chelation chem		check metalsorb dose	check metalsorb dose	check metalsorb dose	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	1	2	2.5	
	Coag dose	mg/L	1	2	2.5	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH	9.17			
	Floc after rapid mix	A-G	Pin	Pin	Pin	
Flocculant Addition	Flocculant/Polymer		check Rheomax dose	check Rheomax dose	check Rheomax dose	
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	1	1.5	3	
	Floc/Poly dose	mg/L	1	1.5	3	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH	9.18			
	Floc after rapid mix	A-G	Pin-C	Pin-C	Pin-C	
Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	9.33	8.81	8.3	
	Floc after slow mix	A-G	Pin-C	F	D	
Settling Stage	Settling Cylinder/Jar		A1	A2	A3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm		30	250	
	Height Sludge After 5 min	mm	5	20	100	
photo	Height Sludge After 10 min	mm	5-8	20	65	
photo	Height Sludge After 20 min	mm	5-8	18	48	
photo and sample	Height Sludge After 30min	mm	5-8	18	43	Still pins in suspension for J3
Sample ID - Hills and inhouse	Supernatant item 3		J1 Super3	J2 Super3	J3 Super3	Sample 50mL then back into jars
Supernatant 1 Testing	Supernatant pH	pH	9.15/8.86	8.40/8.7	7.91/6.12	During test/after inhouse testing
	Supernatant UVT	%	96.1/96.2	93.4/93.9	92.7/92.8	
	Supernatant Turbidity	NTU	0.51/0.52	0.62/0.62	1.39/1.51	
	In house Aluminium (adjust pH)		ABS >3.5 (i.e. >0.5mg/L)	ABS >3.5 (i.e. >0.5mg/L)	0.43/0.429	
Supernatant pH Trimming			check sulphuric dose	check sulphuric dose	check sulphuric dose	
	Target pH	pH	6.5			
	Sample Volume	mL	900	920	850	
Acid Type: Sulphuric	Acid Concentration	%	1	1	1	
RPM: 350	Acid Added (Total) /pH after	mL	0/7.32	0/7.54	0.3/7.3	
	Acid Added (Total) /pH after	mL	0.25/6.99	0.2/7.5	0.3/6.98	
	Acid Added (Total) /pH after	mL	0.3/6.85	0.3/7.2	0.325/6.72	
	Acid Added (Total) /pH after	mL	0.4/6.55	0.35/6.98	0.35/6.58	
	Acid Added (Total) /pH after	mL		0.4/6.82		
	Acid Added (Total) /pH after	mL		0.525/6.52		
	Total time for acid addition		12 mins	30 mins	22 mins	
Second Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	6.8	6.41	6.24	
	Floc after slow mix	A-G	B-C	A	A-B	
pH Trimmed Supernat 2 Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No visible interface	No visible interface	No visible interface	
	Distance Settled After 5 min	mm	No visible interface	No visible interface	No visible interface	
photo	Distance Settled After 10 min	mm	No visible interface	No visible interface	No visible interface	
photo	Distance Settled After 20 min	mm	No visible interface	No visible interface	No visible interface	
photo and sample	Distance Settled After 30min	mm	No visible interface	No visible interface	No visible interface	
Sample ID - Hills and inhouse	Supernatant item 4		Stop testing J1 Super4	Stop testing J2 Super 4	Stop testing J3 Super 4	Stop test, sample 40mL
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH	5.93	7.47	5.62	
	Supernatant UVT	%	94.3/94.6	93.1/93.5	90.5/90.1	
	Supernatant Turbidity	NTU	0.93/0.99	1.17/1.43	3.85/3.05	
	In house Aluminium (adjust pH)		0.371/0.371	0.731/0.739	0.842/0.842	
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5					
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes					

	Test		Run 1B			Notes
	Description		Supernatant item 3	Supernatant item 3	Supernatant item 3	
	Sample		Manchester	Manchester	Manchester	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		6.8.2025	6.8.2025	6.8.2025	
	Time		1.30pm	1.30pm	1.30pm	
	Raw Water pH	pH	2.97	3.1	3.13	
	Raw Water UVT	%	28.3/29.5	28.3/29.5	28.3/29.5	
	Raw Water Turbidity	NTU	40.36/36.54	40.36/36.54	40.36/36.54	
(remember to dilute for Raw water)	In house Aluminium		40	40	40	
(remember to dilute for Raw water)	In house Iron		12.03	12.03	12.03	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	
	Concentration of slurry	%	20	20	20	
	Slurry amount	mL	1.15	1.15	1.15	
	Neutralent Dose	mg/L	230	230	230	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	32	32	32	
	Adjusted pH	pH	8.27	8.16	7.87	
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	2	2	2	
	Coag dose	mg/L	2	2	2	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH				
	Floc after rapid mix	A-G				
Flocculant Addition	Flocculant/Polymer		Rheomax 1050			
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	1.5	1.5	1.5	
	Floc/Poly dose	mg/L	1.5	1.5	1.5	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH	8.54	8.3	8.05	
	Floc after rapid mix	A-G	Instant G start of Slow Mix	Instant G start of Slow Mix	Instant G start of Slow Mix	
Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	8.7	8.68	8.47	
	Floc after slow mix	A-G	G	G	G	
Settling Stage	Settling Cylinder/Jar		All settled in less than 1 min			
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	18	18	20	
	Height Sludge After 5 min	mm				
photo	Height Sludge After 10 min	mm				
photo	Height Sludge After 20 min	mm	15	17	17	
photo and sample	Height Sludge After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 3		Stop testing and bottle up	Stop testing and bottle up	Stop testing and bottle up	
			CONF RUN1B 30MIN (1/3 from each jar into 1L bottles, decant into smaller bottles)			
Supernatant 1 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Supernatant pH Trimming	Target pH	pH				
	Sample Volume	mL				
Acid Type:Sulphuric	Acid Concentration	%				
RPM: 350	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Total time for acid addition					
Second Flocculation Stage	Slow Mix Speed	rpm				
	Slow Mix Time	min				
	pH after slow mix	pH				
	Floc after slow mix	A-G				
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar					
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm				
	Distance Settled After 5 min	mm				
photo	Distance Settled After 10 min	mm				
photo	Distance Settled After 20 min	mm				
photo and sample	Distance Settled After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 4					
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5					
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes					

	Test		Run 2			Notes
	Description		Supernatant item 4	Supernatant item 4	Supernatant item 4	
	Sample		Manchester	Manchester	Manchester	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		7.8.25	7.8.25	7.8.25	
	Time		10.15am	10.15am	10.15am	
	Raw Water pH	pH	2.85			
	Raw Water UVT	%	28.3/29.5	28.3/29.5	28.3/29.5	
	Raw Water Turbidity	NTU	40.36/36.54	40.36/36.54	40.36/36.54	
(remember to dilute for Raw water)	In house Aluminium		40	40	40	
(remember to dilute for Raw water)	In house Iron		12.03	12.03	12.03	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		CaO			
	Concentration of slurry	%	20			
	Slurry amount	mL	1.13			
	Neutralent Dose	mg/L	226			
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	35			
	Adjusted pH	pH	7.97	7.97	7.97	
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	2	2	2	
	Coag dose	mg/L	2	2	2	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	2			
	pH after rapid mix	pH				
	Floc after rapid mix	A-G				
Flocculant Addition	Flocculant/Polymer		Rheomax 1050			
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	1.5	1.5	1.5	
	Floc/Poly dose	mg/L	1.5	1.5	1.5	
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	1			
	pH after rapid mix	pH	8.11			
	Floc after rapid mix	A-G				
Flocculation Stage	Slow Mix Speed	rpm	20			
	Slow Mix Time	min	10			
	pH after slow mix	pH	8.08	8.08	8.08	
	Floc after slow mix	A-G	Instant G, settled in jars within 3 mins of slow mix			
Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	23	20	20	20 Settled rapidly in <1min
	Height Sludge After 5 min	mm	20	20	20	20 Remaining D flocs settled i
photo	Height Sludge After 10 min	mm	20	20	20	20 B flocs still in suspension
photo	Height Sludge After 20 min	mm	20	20	20	20 Only pins in suspension
photo and sample	Height Sludge After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 3					
Supernatant 1 Testing	Supernatant pH	pH	7.71	7.73	7.73	
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Supernatant pH Trimming	Target pH	pH	6.5	6.5	6.5	
	Sample Volume	mL	975	955	975	
Acid Type:Sulphuric	Acid Concentration	%	1	1	1	
RPM: 350	Acid Added (Total) /pH after	mL	0.2/7.04			
	Acid Added (Total) /pH after	mL	0.3/6.73			
	Acid Added (Total) /pH after	mL	0.35/6.48	6.4	6.45	
	Acid Added (Total) /pH after	mL	0.35/6.37	6.33	6.35	
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Total time for acid addition		6 mins	6 mins	6 mins	
Second Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	6.33	6.32	6.31	
	Floc after slow mix	A-G	Pin	Pin	Pin	
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar		A1	A2	A3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No visible Interface	Flocs visible stuck in jar after decant but not visible in cylinders during settling		
	Distance Settled After 5 min	mm				
photo	Distance Settled After 10 min	mm				
photo	Distance Settled After 20 min	mm				
photo and sample	Distance Settled After 30min	mm	No visible flocs			
Sample ID - Hills and inhouse	Supernatant item 4		Stop testing and bottle up	Stop testing and bottle up	Stop testing and bottle up	
			R2 MAN SUPER 4 (blended 1/3 of each jar into 3x 1L bottles then distributed to smaller bottles)			
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5					
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes		After 2nd decant, supernatant volumes remaining in cylinders were 70-120mL			

	Test		Run 3			Notes
	Description		Supernatant item 5	Supernatant item 5	Supernatant item 5	
	Sample		Manchester	Manchester	Manchester	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		7.8.25	7.8.25	7.8.25	
	Time		1pm	10.15am	10.15am	
	Raw Water pH	pH	2.86	2.84		
	Raw Water UVT	%	28.3/29.5	28.3/29.5	28.3/29.5	
	Raw Water Turbidity	NTU	40.36/36.54	40.36/36.54	40.36/36.54	
(remember to dilute for Raw water)	In house Aluminium		40	40	40	
(remember to dilute for Raw water)	In house Iron		12.03	12.03	12.03	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		CaO			
	Concentration of slurry	%	20			
	Slurry amount	mL	1.13			
	Neutralent Dose	mg/L	226			
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	20			
	Adjusted pH	pH	8.22	8.25	8.18	
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	2	2	2	
	Coag dose	mg/L	2	2	2	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1			
	pH after rapid mix	pH				
	Floc after rapid mix	A-G				
Flocculant Addition	Flocculant/Polymer		Rhelmax 1050			
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	1.5	1.5	1.5	
	Floc/Poly dose	mg/L	1.5	1.5	1.5	
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	1			
	pH after rapid mix	pH	8.6			
	Floc after rapid mix	A-G	Instant G			
Flocculation Stage	Slow Mix Speed	rpm	20			
	Slow Mix Time	min	10			
	pH after slow mix	pH	8.62	8.62	8.57	
	Floc after slow mix	A-G	G+ settled rapidly in jars			
Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No clear interface	Graded flocs throughout. Pin at top to G at bottom. Settled <1min		
	Height Sludge After 5 min	mm	19mm ht sludge	20	23	Only B flocs after 1 min
photo	Height Sludge After 10 min	mm	19mm ht sludge	20	23	Only B floc remaining
photo	Height Sludge After 20 min	mm	19mm ht sludge	20	23	Only B floc remaining
photo and sample	Height Sludge After 30min	mm	19mm ht sludge	20	23	Only B floc remaining
Sample ID - Hills and inhouse	Supernatant item 3					
Supernatant 1 Testing	Supernatant pH	pH	8.38	8.48	8.28	
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Supernatant pH Trimming	Target pH	pH	6.5	6.5	6.5	
	Sample Volume	mL				
Acid Type:Sulphuric	Acid Concentration	%	1	1	1	
RPM: 350	Acid Added (Total) /pH after	mL	0.2/7.53	0.2/7.44	0.2/7.3	
	Acid Added (Total) /pH after	mL	0.37/6.55	0.31/6.57	0.27/6.57	
	Acid Added (Total) /pH after	mL	0.37/6.53	0.31/6.53	0.27/6.49	
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Total time for acid addition					
Second Flocculation Stage	Slow Mix Speed	rpm	20			
	Slow Mix Time	min	10			
	pH after slow mix	pH	6.53	6.51	6.52	
	Floc after slow mix	A-G	pin-A	pin-A	pin-A	
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar		A1	A2	A3	Flocs visible in jars after decant
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No visible flocs or interface			
	Distance Settled After 5 min	mm				
photo	Distance Settled After 10 min	mm				
photo	Distance Settled After 20 min	mm				
photo and sample	Distance Settled After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 4					
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5		RUN 3 MAN SUPER 5 2:40pm 8.8.2025			Stop testing and bottle up
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes					

Test		Run 4			Notes
Description		Supernatant item 3			
Sample		BVE	BVE	BVE	
Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw				
Date		8.8.2025	8.8.2025	8.8.2025	
Time		10.15am	10.15am	10.15am	
Raw Water pH	pH	3.47	3.49		
Raw Water UVT	%	64.2/65.0	64.2/65.0	64.2/65.0	
Raw Water Turbidity	NTU	8.12/7.59	8.12/7.59	8.12/7.59	
(remember to dilute for Raw water)	In house Aluminium	8.82	8.82	8.82	
(remember to dilute for Raw water)	In house Iron	5.1	5.1	5.1	
Confirm Dosing - Compare Raw					
Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc	CaO	CaO	CaO	
	Concentration of slurry	%	20	20	
	Slurry amount	mL	0.35	0.35	
	Neutralent Dose	mg/L	70	70	
	Rapid Mix Speed	rpm	350	350	
	Rapid Mix Time	min	30	30	
	Adjusted pH	pH	7.94	7.84	
Coagulant /Chelant Addition	Coagulation/Chelation chem	Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	
	Coag amount	mL	1	1	
	Coag dose	mg/L	1	1	
	Rapid Mix Speed	rpm	350	350	
	Rapid Mix Time	min	1	1	
	pH after rapid mix	pH	7.98	7.88	
	Floc after rapid mix	A-G			
Flocculant Addition	Flocculant/Polymer	Rheomax 1050	Rheomax 1050	Rheomax 1050	
	Floc/Poly Conc	%	0.1	0.1	
	Floc/Poly amount	mL	1	1	
	Floc/Poly dose	mg/L	1	1	
	Rapid Mix Speed	rpm	350	350	
	Rapid Mix Time	min	1	1	
	pH after rapid mix	pH			
	Floc after rapid mix	A-G			Instant flocs
Flocculation Stage	Slow Mix Speed	rpm	20	20	
	Slow Mix Time	min	10	10	
	pH after slow mix	pH	7.98	7.95	
	Floc after slow mix	A-G	E	E-F	
Settling Stage	Settling Cylinder/Jar	B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	310	300	Mostly all settled but sparse interface of flocs remaining
	Height Sludge After 5 min	mm	300	280	
photo	Height Sludge After 10 min	mm	240	240	
photo	Height Sludge After 20 min	mm	150	180	
photo and sample	Height Sludge After 30min	mm	90	120	Almost all settled but a few flocs in suspension
Sample ID - Hills and inhouse	Supernatant item 3		RUN 4 BVE SUPER 3 8.8.25 11.45am		
Supernatant 1 Testing	Supernatant pH	pH			
	Supernatant UVT	%			
	Supernatant Turbidity	NTU			
	In house Aluminium (adjust pH)				
Supernatant pH Trimming	Target pH	pH			
	Sample Volume	mL			
Acid Type:Sulphuric	Acid Concentration	%			
RPM: 350	Acid Added (Total) /pH after	mL			
	Acid Added (Total) /pH after	mL			
	Acid Added (Total) /pH after	mL			
	Acid Added (Total) /pH after	mL			
	Acid Added (Total) /pH after	mL			
	Acid Added (Total) /pH after	mL			
	Acid Added (Total) /pH after	mL			
	Total time for acid addition				
Second Flocculation Stage	Slow Mix Speed	rpm			
	Slow Mix Time	min			
	pH after slow mix	pH			
	Floc after slow mix	A-G			
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar				
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm			
	Distance Settled After 5 min	mm			
photo	Distance Settled After 10 min	mm			
photo	Distance Settled After 20 min	mm			
photo and sample	Distance Settled After 30min	mm			
Sample ID - Hills and inhouse	Supernatant item 4				
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH			
	Supernatant UVT	%			
	Supernatant Turbidity	NTU			
	In house Aluminium (adjust pH)				
Settling cont- photo and sample	Distance Settled After 24Hr	mm			
Sample ID - Hills and inhouse	Supernatant item 5				
24hr Supernatant 3 Testing	Supernatant pH	pH			
	Supernatant UVT	%			
	Supernatant Turbidity	NTU			
	In house Aluminium (adjust pH)				
	Notes				

	Test		Run 5			Notes
	Description		Supernatant item 4			
	Sample		BVE	BVE	BVE	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		8.8.2025	8.8.2025	8.8.2025	
	Time		12.30pm	12.30pm	12.30pm	
	Raw Water pH	pH	3.41	3.44	3.45	
	Raw Water UVT	%	64.2/65.0	64.2/65.0	64.2/65.0	
	Raw Water Turbidity	NTU	8.12/7.59	8.12/7.59	8.12/7.59	
(remember to dilute for Raw water)	In house Aluminium		8.82	8.82	8.82	
(remember to dilute for Raw water)	In house Iron		5.1	5.1	5.1	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	
	Concentration of slurry	%	20	20	20	
	Slurry amount	mL	0.36	0.36	0.36	
	Neutralent Dose	mg/L	72	72	72	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	30	30	30	
	Adjusted pH	pH	7.89	7.83	7.85	
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	1	1	1	
	Coag dose	mg/L	1	1	1	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH				
	Floc after rapid mix	A-G				
Flocculant Addition	Flocculant/Polymer		Rheomax 1050	Rheomax 1050	Rheomax 1050	
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	1	1	1	
	Floc/Poly dose	mg/L	1	1	1	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH	7.92	7.89	7.92	
	Floc after rapid mix	A-G				
Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	7.89	7.86	7.88	
	Floc after slow mix	A-G	E-F Instant then settling in jar. A couple of floating flocs			
Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	300	300	300	Most settled <1 min but a few B-D flocs in suspension settling slowly as shown
	Height Sludge After 5 min	mm	290	300	280	
photo	Height Sludge After 10 min	mm	200	300	240	
photo	Height Sludge After 20 min	mm	130	250	120	
photo and sample	Height Sludge After 30min	mm	10	250	90	
Sample ID - Hills and inhouse	Supernatant item 3					
Supernatant 1 Testing	Supernatant pH	pH	7.5	7.47	7.56	
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Supernatant pH Trimming						
	Target pH	pH	6.5	6.5	6.5	
	Sample Volume	mL				
Acid Type:Sulphuric	Acid Concentration	%	1	1	1	
RPM: 350	Acid Added (Total) /pH after	mL	0.2/7.21	0.2/7.11	0.2/7.12	2 mins
	Acid Added (Total) /pH after	mL		0.3/6.49		7 mins
	Acid Added (Total) /pH after	mL	0.47/6.5		0.37/6.61	11mins
	Acid Added (Total) /pH after	mL			0.41/6.53	12 mins
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Total time for acid addition		12 mins	12 mins	12 mins	
Second Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	6.59	6.55	6.57	
	Floc after slow mix	A-G	Pin-A	Pin-A	Pin-A	
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No visible interface			
	Distance Settled After 5 min	mm				
photo	Distance Settled After 10 min	mm				
photo	Distance Settled After 20 min	mm				
photo and sample	Distance Settled After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 4		RUN 5 BVE SUPER 4 8.8.25 3.30pm			
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5					
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes					

	Test		Run 6				Notes
	Description		Supernatant item 5				
	Sample		BVE	BVE	BVE		
	Sediment Added	g	3	3	3		
Sample ID - Hills and inhouse	Raw						
	Date		11.8.2025	11.8.2025	11.8.2025		
	Time		11am	11am	11am		
	Raw Water pH	pH	3.41	3.22	3.24		
	Raw Water UVT	%	64.2/65.0	64.2/65.0	64.2/65.0		
	Raw Water Turbidity	NTU	8.12/7.59	8.12/7.59	8.12/7.59		
(remember to dilute for Raw water)	In house Aluminium		8.82	8.82	8.82		
(remember to dilute for Raw water)	In house Iron		5.1	5.1	5.1		
	Confirm Dosing - Compare Raw						
	Jar - 1 litre		1	2	3		
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO		
	Concentration of slurry	%	20	20	20		
	Slurry amount	mL	0.34	0.34	0.3		
	Neutralent Dose	mg/L	68	68	60		
	Rapid Mix Speed	rpm	350	350	350		
	Rapid Mix Time	min	20	20	20		
	Adjusted pH	pH	8.66	8.1	7.85		
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb		
	Coag Conc	%	0.1	0.1	0.1		
	Coag amount	mL	1	1	1		
	Coag dose	mg/L	1	1	1		
	Rapid Mix Speed	rpm	350	350	350		
	Rapid Mix Time	min	1	1	1		
	pH after rapid mix	pH					
	Floc after rapid mix	A-G					
Flocculant Addition	Flocculant/Polymer		Rheomax 1050	Rheomax 1050	Rheomax 1050		
	Floc/Poly Conc	%	0.1	0.1	0.1		
	Floc/Poly amount	mL	1	1	1		
	Floc/Poly dose	mg/L	1	1	1		
	Rapid Mix Speed	rpm	350	350	350		
	Rapid Mix Time	min	1	1	1		
	pH after rapid mix	pH	8.86				
	Floc after rapid mix	A-G	D-E	D-E	D-E		
Flocculation Stage	Slow Mix Speed	rpm	350	350	350		
	Slow Mix Time	min	10	10	10		
	pH after slow mix	pH	8.72	8.34	8.16		
	Floc after slow mix	A-G	Settled in jar with a few A-B remianing in suspension				
Settling Stage	Settling Cylinder/Jar		B1	B2	B3		
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No interface visible. B floccs in suspension. Es settled to 5mm ht				
	Height SludgeAfter 5 min	mm					
photo	Height Sludge After 10 min	mm					
photo	Height Sludge After 20 min	mm					
photo and sample	Height Sludge After 30min	mm	Still A-B in suspension				
Sample ID - Hills and inhouse	Supernatant item 3						
Supernatant 1 Testing	Supernatant pH	pH	9.19	9.01			
	Supernatant UVT	%					
	Supernatant Turbidity	NTU					
	In house Aluminium (adjust pH)						
Supernatant pH Trimming	Target pH	pH	6.5	6.5	6.5		
	Sample Volume	mL	980	950	950		
Acid Type:Sulphuric	Acid Concentration	%	1				
RPM: 350	Acid Added (Total) /pH after	mL	0.2/8.52	0.2/7.7	0.2/6.05	2 mins	
	Acid Added (Total) /pH after	mL	0.2/6.77	0.2/6.53	0.2/5.36	5 mins	
	Acid Added (Total) /pH after	mL					
	Acid Added (Total) /pH after	mL					
	Acid Added (Total) /pH after	mL					
	Acid Added (Total) /pH after	mL					
	Total time for acid addition		5 mins				
Second Flocculation Stage	Slow Mix Speed	rpm	20	20	20		
	Slow Mix Time	min	10	10	10		J1 no visible floccs in jar after decant
	pH after slow mix	pH	6.05	5.95	5.21		J 2&3 visible floccs in jar after decant
	Floc after slow mix	A-G	Pin - B	Pin - A	Pin - A		Note; Floccs stuck to pH probe
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar		A1	A2	A3		
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	Pin-A or B	Pin-A or B	Pin - A		
	Distance Settled After 5 min	mm	No clear interface				
photo	Distance Settled After 10 min	mm					
photo	Distance Settled After 20 min	mm					
photo and sample	Distance Settled After 30min	mm					
Sample ID - Hills and inhouse	Supernatant item 4						
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH					
	Supernatant UVT	%					
	Supernatant Turbidity	NTU					
	In house Aluminium (adjust pH)						
Settling cont- photo and sample	Distance Settled After 24Hr	mm	No visible floc or sludge volume only a few specks visible on base surface of cylinder				
Sample ID - Hills and inhouse	Supernatant item 5		RUN 6 BVE SUPER 5 12.08.2025 1:06PM				
24hr Supernatant 3 Testing	Supernatant pH	pH					
	Supernatant UVT	%					
	Supernatant Turbidity	NTU					
	In house Aluminium (adjust pH)						
	Notes		Volume remaining after 2nd decant (mL)				
			140	150	160		

	Test		Run 7			Notes
	Description		Supernatant item 3			
	Sample		S23	S23	S23	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		12.08.2025	12.08.2025	12.08.2025	
	Time		10.30am	10.30am	10.30am	
	Raw Water pH	pH	3.01	2.99	2.98	
	Raw Water UVT	%	-0.2/-0.2	-0.2/-0.2	-0.2/-0.2	
	Raw Water Turbidity	NTU	0.63/7.41/1.64/0.68/0.82	0.63/7.41/1.64/0.68/0.82	0.63/7.41/1.64/0.68/0.82	
(remember to dilute for Raw water)	In house Aluminium		254.25	254.25	254.25	
(remember to dilute for Raw water)	In house Iron		187.2	187.2	187.2	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO	
	Concentration of slurry	%	20	20	20	
	Slurry amount	mL	8.02	8	8	
	Neutralent Dose	mg/L	1604	1600	1600	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	40	40	40	
	Adjusted pH	pH	8.12	8.09	8.07	
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	2.5	2.5	2.5	
	Coag dose	mg/L	2.5	2.5	2.5	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH	8.21			
	Floc after rapid mix	A-G	Pin			
Flocculant Addition	Flocculant/Polymer		Rheomax 1050	Rheomax 1050	Rheomax 1050	
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	3	3	3	
	Floc/Poly dose	mg/L	3	3	3	
	Rapid Mix Speed	rpm	350	350	350	
	Rapid Mix Time	min	1	1	1	
	pH after rapid mix	pH	8.27	8.29		
	Floc after rapid mix	A-G	Large Instant flocs	Large Instant flocs	Large Instant flocs	
Flocculation Stage	Slow Mix Speed	rpm	20			
	Slow Mix Time	min	10			
	pH after slow mix	pH	8.25	8.21	8	
	Floc after slow mix	A-G	E-F settled rapidly in jar	E-F settled rapidly in jar	E-F settled rapidly in jar	
Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	42	38	40	settled <1min. Ht sludge
	Height Sludge After 5 min	mm				
photo	Height Sludge After 10 min	mm	37	35	36	
photo	Height Sludge After 20 min	mm	36	34	35	
photo and sample	Height Sludge After 30min	mm	35	33	34	
Sample ID - Hills and inhouse	Supernatant item 3		RUN 7 S23 SUPER 3			
Supernatant 1 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Supernatant pH Trimming	Target pH	pH	(130mL after decant)	130mL	170mL	
	Sample Volume	mL				
Acid Type:Sulphuric	Acid Concentration	%				
RPM: 350	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Total time for acid addition					
Second Flocculation Stage	Slow Mix Speed	rpm				
	Slow Mix Time	min				
	pH after slow mix	pH				
	Floc after slow mix	A-G				
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar					
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm				
	Distance Settled After 5 min	mm				
photo	Distance Settled After 10 min	mm				
photo	Distance Settled After 20 min	mm				
photo and sample	Distance Settled After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 4					
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5					
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes					

	Test		Run 8			Notes
	Description		Supernatant item 4			
	Sample		S23	S23	S23	
	Sediment Added	g	3	3	3	
Sample ID - Hills and inhouse	Raw					
	Date		13.05.2025	13.05.2025	13.05.2025	
	Time		8.45am-11.40am	8.45am-11.40am	8.45am-11.40am	
	Raw Water pH	pH	2.19			
	Raw Water UVT	%	-0.2/-0.2	-0.2/-0.2	-0.2/-0.2	
	Raw Water Turbidity	NTU	0.63/7.41/1.64/0.68/0.82	0.63/7.41/1.64/0.68/0.82	0.63/7.41/1.64/0.68/0.82	
(remember to dilute for Raw water)	In house Aluminium		254.25	254.25	254.25	
(remember to dilute for Raw water)	In house Iron		187.2	187.2	187.2	
	Confirm Dosing - Compare Raw					
	Jar - 1 litre		1	2	3	
Neutralent Addition	Chem added/Mgo/CaO etc		CaO			
	Concentration of slurry	%	20			
	Slurry amount	mL	8.16	8.18	8.18	
	Neutralent Dose	mg/L	1632			
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	50			
	Adjusted pH	pH	8.04	8.02	8.04	
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb	
	Coag Conc	%	0.1	0.1	0.1	
	Coag amount	mL	2.5	2.5	2.5	
	Coag dose	mg/L	2.5	2.5	2.5	
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	1			
	pH after rapid mix	pH				
	Floc after rapid mix	A-G	Pin-A-B			
Flocculant Addition	Flocculant/Polymer		Rheomax 1050			
	Floc/Poly Conc	%	0.1	0.1	0.1	
	Floc/Poly amount	mL	3	3	3	
	Floc/Poly dose	mg/L	3	3	3	
	Rapid Mix Speed	rpm	350			
	Rapid Mix Time	min	1			
	pH after rapid mix	pH	8.13	8.16	8.17	
	Floc after rapid mix	A-G	Instant G+			
Flocculation Stage	Slow Mix Speed	rpm	20			
	Slow Mix Time	min	10			
	pH after slow mix	pH	8.07	8.05	8.05	
	Floc after slow mix	A-G	Instant G+ settled in jar in less than 1 min			
Settling Stage	Settling Cylinder/Jar		B1	B2	B3	
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	48	49	55	Mostly all settled in <1min
	Height Sludge After 5 min	mm	42	41	44	except a few B-C flocs
photo	Height Sludge After 10 min	mm	42	40	42	Note J3 had an E floc
photo	Height Sludge After 20 min	mm	38	38	40	floating
photo and sample	Height Sludge After 30min	mm		36	38	
Sample ID - Hills and inhouse	Supernatant item 3					
Supernatant 1 Testing	Supernatant pH	pH	7.57	7.53	7.52	
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Supernatant pH Trimming	Target pH	pH	6.5	6.5	6.5	
	Sample Volume	mL	920	900	900	
Acid Type:Sulphuric	Acid Concentration	%	1	1	1	
RPM: 350	Acid Added (Total) /pH after	mL	0.1/7.008	0.1/6.85	0.1/6.81	
	Acid Added (Total) /pH after	mL	0.2/6.46	0.15/6.48	0.15/6.48	
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Acid Added (Total) /pH after	mL				
	Total time for acid addition		9 mins	9 mins	9 mins	
Second Flocculation Stage	Slow Mix Speed	rpm	20	20	20	
	Slow Mix Time	min	10	10	10	
	pH after slow mix	pH	6.56	6.51	6.52	
	Floc after slow mix	A-G	Pin			
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar		A1	A2	A3	A few pins left in jar after decant
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	Pins but no interface visible			
	Distance Settled After 5 min	mm	A few pins visible on base of cylinder			
photo	Distance Settled After 10 min	mm				
photo	Distance Settled After 20 min	mm				
photo and sample	Distance Settled After 30min	mm				
Sample ID - Hills and inhouse	Supernatant item 4		RUN 8 S23 SUPER 4 13.8.2025 11.40am			
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
Settling cont- photo and sample	Distance Settled After 24Hr	mm				
Sample ID - Hills and inhouse	Supernatant item 5					
24hr Supernatant 3 Testing	Supernatant pH	pH				
	Supernatant UVT	%				
	Supernatant Turbidity	NTU				
	In house Aluminium (adjust pH)					
	Notes					

	Test		Run 9				Notes
	Description		Supernatant item 5				
	Sample		S23	S23	S23		
	Sediment Added	g	3	3	3	3	
Sample ID - Hills and inhouse	Raw						
	Date		13.08.2025	13.08.2025	13.08.2025		
	Time		11.30am	11.30am	11.30am		
	Raw Water pH	pH	2.37	2.39	2.39		
	Raw Water UVT	%	-0.2/-0.2	-0.2/-0.2	-0.2/-0.2		
	Raw Water Turbidity	NTU	0.63/7.41/1.64/0.68/0.82	0.63/7.41/1.64/0.68/0.82	0.63/7.41/1.64/0.68/0.82		
(remember to dilute for Raw water)	In house Aluminium		254.25	254.25	254.25		
(remember to dilute for Raw water)	In house Iron		187.2	187.2	187.2		
	Confirm Dosing - Compare Raw						
	Jar - 1 litre		1	2	3		
Neutralent Addition	Chem added/Mgo/CaO etc		CaO	CaO	CaO		
	Concentration of slurry	%	20	20	20		
	Slurry amount	mL	8.28	8.3	8.38		
	Neutralent Dose	mg/L	1656	1660	1676		
	Rapid Mix Speed	rpm	350	350	350		
	Rapid Mix Time	min	35	35	35		
	Adjusted pH	pH	8.17	8.04	8.04		
Coagulant /Chelant Addition	Coagulation/Chelation chem		Metalsorb	Metalsorb	Metalsorb		
	Coag Conc	%	0.1	0.1	0.1		
	Coag amount	mL	2.5	2.5	2.5		
	Coag dose	mg/L	2.5	2.5	2.5		
	Rapid Mix Speed	rpm	350	350	350		
	Rapid Mix Time	min	1	1	1		
	pH after rapid mix	pH					
	Floc after rapid mix	A-G					
Flocculant Addition	Flocculant/Polymer		Rheomax 1050	Rheomax 1050	Rheomax 1050		
	Floc/Poly Conc	%	0.1	0.1	0.1		
	Floc/Poly amount	mL	3	3	3		
	Floc/Poly dose	mg/L	3	3	3		
	Rapid Mix Speed	rpm	350	350	350		
	Rapid Mix Time	min	1	1	1		
	pH after rapid mix	pH	8.25	8.2	8.13		
	Floc after rapid mix	A-G					
Flocculation Stage	Slow Mix Speed	rpm	20	20	20		
	Slow Mix Time	min	10	10	10		
	pH after slow mix	pH	8.29	8.2	8.19		
	Floc after slow mix	A-G	G settled rapidly in jars	G settled rapidly in jars	G settled rapidly in jars		
Settling Stage	Settling Cylinder/Jar		B1	B2	B3		
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	45	50	50	All settled <1min except for a few B-D flocs still falling	
	Height SludgeAfter 5 min	mm	40	40	40		
photo	Height Sludge After 10 min	mm	39	40	39		
photo	Height Sludge After 20 min	mm					
photo and sample	Height Sludge After 30min	mm	36	37	37		
Sample ID - Hills and inhouse	Supernatant item 3						
Supernatant 1 Testing	Supernatant pH	pH	7.56-7.67	7.51	7.5		
	Supernatant UVT	%					
	Supernatant Turbidity	NTU					
	In house Aluminium (adjust pH)						
Supernatant pH Trimming	Target pH	pH	6.5	6.5	6.5		
	Sample Volume	mL	900	900	920		
Acid Type:Sulphuric	Acid Concentration	%	1	1	1		
RPM: 350	Acid Added (Total) /pH after	mL	0.1/7.45	0.1/7.31	0.1/7.29		
	Acid Added (Total) /pH after	mL	0.2/7.07	0.15/6.86	0.15/6.83		
	Acid Added (Total) /pH after	mL	0.31/6.47	0.2/6.43	0.2/6.39		
	Acid Added (Total) /pH after	mL					
	Acid Added (Total) /pH after	mL					
	Acid Added (Total) /pH after	mL					
	Total time for acid addition		9 mins				
Second Flocculation Stage	Slow Mix Speed	rpm	20	20	20		
	Slow Mix Time	min	10	10	10		
	pH after slow mix	pH	6.51	6.47	6.45		
	Floc after slow mix	A-G		Pin-A-B	Pin-A		Pin flocs visible in jars after decanting
pH Trimmed Supernant 2 Settling Stage	Settling Cylinder/Jar		A1 (900ml)	A2 (890ml)	A3 (920mL)		
(photos at 10, 20, 30min)	Distance Settled After 1 min	mm	No visible interface but flocs visible in suspension				
	Distance Settled After 5 min	mm					
photo	Distance Settled After 10 min	mm					
photo	Distance Settled After 20 min	mm					
photo and sample	Distance Settled After 30min	mm					
Sample ID - Hills and inhouse	Supernatant item 4		RUN 9 S23 SUPER 5 13.80.2025 1.34pm				
pH Trimmed Supernatant 2 Testing	Supernatant pH	pH					
	Supernatant UVT	%					
	Supernatant Turbidity	NTU					
	In house Aluminium (adjust pH)						
Settling cont- photo and sample	Distance Settled After 24Hr	mm					
Sample ID - Hills and inhouse	Supernatant item 5						
24hr Supernatant 3 Testing	Supernatant pH	pH					
	Supernatant UVT	%					
	Supernatant Turbidity	NTU					
	In house Aluminium (adjust pH)						
	Notes						

APPENDIX C – CHEMICAL AND NEUTRALISING AGENT DATA

ANALYTICAL REPORT

Order code:	EUNZWE-00196988
Purchase Order Number:	1017166

Sample Name	Makareao Oxide 13-17/7		
Sample Reference	Makareao Oxide		
Reception Date & Time:	02/08/2024 9:30		
Analysis Started on:	03/08/2024	Analysis Ending Date:	05/08/2024
Product Type	Quicklime	Sampled Date & Time	30/07/2024 00:00
Sampler(s)	CUSTOMER		

		RESULTS		LOQ
NW499	Arsenic - Total			
	Arsenic (As)	0.34	mg/kg	0.05
NW504	Cadmium - Total			
	Cadmium (Cd)	0.64	mg/kg	0.01
NW507	Chromium - Total			
	Chromium (Cr)	8.8	mg/kg	0.2
NW509	Copper - Total			
	Copper (Cu)	1.3	mg/kg	0.3
NW511	Lead - Total			
	Lead (Pb)	0.5	mg/kg	0.1
NW515	Mercury - Total			
	Mercury (Hg)	<0.1	mg/kg	0.1
NW517	Nickel - Total			
	Nickel (Ni)	1.2	mg/kg	0.2

NW499	Arsenic - Total: APHA Online Edition 3125 B mod.	NW504	Cadmium - Total: APHA Online Edition 3125 B mod.
NW507	Chromium - Total: APHA Online Edition 3125 B mod.	NW509	Copper - Total: APHA Online Edition 3125 B mod.
NW511	Lead - Total: APHA Online Edition 3125 B mod.	NW515	Mercury - Total: APHA Online Edition 3125 B mod.
NW517	Nickel - Total: APHA Online Edition 3125 B mod.		

Signature

Food & Water Testing

EXPLANATORY NOTE

- ① Test is not accredited
- ② Test is subcontracted within Eurofins group and is accredited
- ③ Test is subcontracted within Eurofins group and is not accredited
- ④ Test is subcontracted outside Eurofins group and is accredited
- ⑤ Test is subcontracted outside Eurofins group and is not accredited
- ⑥ Test result is provided by the customer and is not accredited
- ⑦ Tested at the sampling point by Eurofins and is not accredited
- ⑧ Tested at the sampling point by Eurofins and is accredited
- ⑨ Test is RLP accredited
- ⑩ Test is subcontracted within Eurofins group and is RLP accredited

N/A means Not Applicable

Not Detected means not detected at or above the Limit of Quantification (LOQ)

LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

✗ (Unsatisfactory) means does not meet the specification

✓ (Satisfactory) means meets the specification

All test method Quality Controls including method blanks, reference samples, spikes, surrogates, and duplicate sample testing, have passed and are within the control limits.

The Customer acknowledges and accepts that: (a) where Eurofins is not responsible for sampling, the test result(s) in this report apply only to the sample as received.

Customer is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the product.

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The tests are identified by a five-digit code, their description is available on request.

Accreditation does not apply to comments or graphical representations.

Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.

Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.

All samples become the property of Eurofins to the extent necessary for the performance of the Services.

Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.

If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.

The Eurofins water sampling service follows methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.

The Customer acknowledges that the Services are provided using the current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.

This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.

Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.

Eurofins General Terms and Conditions apply.

END OF REPORT



SAFETY DATA SHEET

Section 1. Identification of the material and the supplier

Product: **High Calcium Quicklime**
Product Use: Neutralisation, flocculation, flux(met.), caustic agent, absorption, stabilisation.
Restriction of Use in NZ: Refer to Section 15

Date of SDS Preparation: 5 October 2022

Section 2. Hazards Identification

Classified as hazardous as per EPA Hazardous Substances (Classification) Notice 2020.

EPA Approval No: Construction Products (Corrosive) – HSR002542

Pictograms



Signal Word: **DANGER**

GHS Classification and Category	Hazard Code	Hazard Statement
Skin corrosion Cat. 1C	H314	Causes severe skin burns and eye damage.
Serious eye damage Cat. 1	H318	Causes serious eye damage.

Prevention Code	Prevention Statement
P102	Keep out of reach of children.
P103	Read label before use.
P260	Do not breathe dust, fumes, gas, mist, vapours or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective clothing as detailed in Section 8.

Response Code	Response Statement
P101	If medical advice is needed, have product container or label at hand.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P301 +	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P330+P331	
P303 + P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage Code	Storage Statement
P405	Store locked up.

Disposal Code	Disposal Statement
P501	Dispose of according to Local Regulations or Authorities as per Section 13.

Section 3. Composition / Information on Hazardous Ingredients

Ingredients	Wt%	CAS NUMBER.
Calcium Oxide	88 - 99	1305-78-8

Crystalline silica has been found in some products at or above detection level 0.1%. Concentration is dependent upon limestone source. However, using the sedimentation method set out in the draft European Standard followed by XRD analysis, all products were shown to have respirable crystalline silica content of <0.1%.

Section 4. First Aid Measures

Routes of Exposure:

If in Eyes	Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
If on Skin	Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse
If Swallowed	Get medical attention immediately. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
If Inhaled	Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms and effects, both acute and delayed

Symptoms:

Ingestion:	No known significant effects or critical hazards. Over exposure: stomach pains.
Inhalation:	May cause respiratory irritation. Over exposure: respiratory tract irritation, Coughing.
Skin:	Causes severe burns. Over exposure: pain or irritation, redness and blistering may occur.
Eye:	Causes serious eye damage. Over exposure: pain, watering and redness.
Chronic:	May cause damage to organs through repeated or prolonged exposure.

Notes to Doctor: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Section 5. Fire Fighting Measures

Hazard Type	Non Flammable
Hazards from products	Decomposition products may include the following materials: carbon dioxide metal oxide/oxides
Suitable Extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of quicklime.
Precautions for firefighters and special protective clothing	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
HAZCHEM CODE	2X

Section 6. Accidental Release Measures**Personal precautions:**

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions:

Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways or air). Water polluting material. May be harmful to the environment if released in large quantities. (pH increase).

Spill and Disposal procedures:

Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Scoop up material and place in a disposal container. Provide ventilation. Dispose of waste safely, according to local Council regulations as per Section 13.

Small Spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container.

Large Spill: Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and

place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container.

Section 7. Handling and Storage

Precautions for Handling:

- Read label before use.
- Do not breathe dust, fumes, gas, mist, vapours or spray.
- Wear protective clothing as detailed in Section 8.
- Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Workers should wash hands and face before eating, drinking and smoking.
- Remove contaminated clothing and protective equipment before entering eating areas.
- Do not get in eyes or on skin or clothing. Do not ingest.
- Avoid release to the environment.
- If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator.
- Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
- Empty containers retain product residue and can be hazardous.
- Do not reuse container.

Precautions for Storage:

- Keep out of reach of children.
- Store locked up.
- Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see Section 10) and food and drink.
- Store to minimise dust generation.
- Keep container tightly closed and sealed until ready for use.
- Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
- Do not store in unlabelled containers.
- Use appropriate containment to avoid environmental contamination.

Section 8 Exposure Controls / Personal Protection

WORKPLACE EXPOSURE STANDARDS (provided for guidance only)

Substance		TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Calcium hydroxide	[1305-62-0]	-	5	-	-

Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure. Workplace Exposure Standard – Short-Term Exposure Limit (WES-STEL). The 15-minute average exposure standard. Applies to any 15- Minute period in the working day and is designed to protect the worker against adverse effects of irritation, chronic or irreversible tissue change, or narcosis that may increase the likelihood of accidents. The WES-STEL is not an alternative to the WES-TWA; both the short-term and time-weighted average exposures apply. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 13TH EDITION.

Engineering Controls

If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Personal Protection Equipment

Product Name: **High Calcium Quicklime**
Date of SDS: 5 October 2022

SDS Prepared by: Nexreg Compliance Inc.
Tel: +1-519-488-5126



Eyes	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hands	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Skin	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Wear an appropriate NIOSH approved respirator if concentration levels exceed the safe exposure limits.
General	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9 Physical and Chemical Properties

Appearance	Solid (Crystalline)
Colour	White
Odour	Odourless + soil like smell
Odour Threshold	Not available
pH	12.45[Sat.soln] @ 25°C
Boiling Point	2850°C
Melting Point	2570 to 2625°C
Freezing Point	Not available
Flash Point	Not available
Flammability	Not Flammable
Upper and Lower Explosive Limits	Not available
Vapour Pressure	Not available
Vapour Density	Not available
Relative Density	3.25 to 3.28
Water Solubility	0.125g/100g at 20°C
Partition Coefficient:	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Kinematic Viscosity	Not available
Particle Characteristics	Not available

Section 10. Stability and Reactivity

Stability of Substance	The product is stable. Absorbs moisture and Carbon Dioxide in the air to form Calcium Hydroxide and Calcium Carbonate.
Possibility of hazardous reactions	Exothermic reaction to water.
Conditions to Avoid	Do not allow quicklime to come into contact with incompatible materials. e.g. Water, acids, reactive fluoridated compounds, reactive brominated compounds, reactive powdered metals, organic acid anhydrides, nitro-organic compounds, reactive phosphorous compounds, interhalogenated compounds.
Incompatible Materials	Reactive or incompatible with the following materials: oxidising materials, acids and moisture.
Hazardous Decomposition Products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information**Acute Effects:**

Swallowed	Not applicable however over exposure could cause stomach pains. Repeated exposure may cause severe mucous membrane irritation, bronchitis and pneumonia.
Dermal	Not applicable.
Inhalation	Not applicable may include respiratory tract irritation and coughing.
Eye	Causes serious eye damage. Symptoms may include pain, watering and redness.
Skin	Causes severe burns. Symptoms include pain or irritation, redness and blistering may occur. Prolonged exposure may cause irritant dermatitis.

Chronic Effects:

Carcinogenicity	Not applicable.
Reproductive Toxicity	Not applicable.
Germ Cell Mutagenicity	Not applicable.
Aspiration	Not applicable.
STOT/SE	Not applicable.
STOT/RE	Not applicable.

Section 12. Ecotoxicological Information

This material is harmful to aquatic life.

Persistence and degradability	No data available
Bioaccumulation	Calcium Oxide: BCF = 2.34 Potential: Low
Mobility in Soil	No data available
Other adverse effects	No data available

Product/ingredient	Result	Species	Exposure
Calcium oxide	Chronic NOEC 100 mg/L Fresh water	Fish - Oreochromis niloticus - Juvenile (Fledgling, Hatchling, Weanling)	46 days

Section 13. Disposal Considerations**Disposal Method:**

The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Precautions or methods to avoid: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Section 14 Transport Information

This product is NOT classified as a Dangerous Good for transport in NZ; NZS 5433:2020

Section 15 Regulatory Information

This substance is classified hazardous according to the EPA Hazardous Substances (Classification) Notice 2020

EPA Approval Code: **Construction Products (Corrosive) – HSR002542**

HSW (HS) Regulations 2017 and EPA Notices	Trigger Quantity
Certified Handler	Not required
Location Certificate	Not required
Tracking Trigger Quantities	Not required
Signage Trigger Quantities	1000kg
Emergency Response Plan	10 000kg
Secondary Containment	10 000kg
Restriction of Use	Only use for the intended purpose.

Section 16 Other Information

Glossary

Cat	Category
EC ₅₀	Median effective concentration.
EEL	Environmental Exposure Limit.
EPA	Environmental Protection Authority
HSNO	Hazardous Substances and New Organisms.
HSW	Health and Safety at Work.
LC ₅₀	Lethal concentration that will kill 50% of the test organisms inhaling or ingesting it.
LD ₅₀	Lethal dose to kill 50% of test animals/organisms.
LEL	Lower explosive level.
OSHA	American Occupational Safety and Health Administration.
TEL	Tolerable Exposure Limit.
TLV	Threshold Limit Value-an exposure limit set by responsible authority.
UEL	Upper Explosive Level
WES	Workplace Exposure Limit

1. EPA Hazardous Substances (Safety Data Sheets) Notice 2017
2. Workplace Exposure Standards and Biological Exposure Indices APRIL 2022 edition.
3. Assigning a hazardous substance to a HSNO Approval (Aug 2013).
4. Transport of Dangerous goods on land NZS 5433:2020
5. HSW (Hazardous Substances) Regulations 2017

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Please contact the New Zealand distributor, if further information is required.

Issue Date: 5 October 2022

Review Date: 5 October 2027

HIGH CALCIUM QUICKLIME

Nominal size: 0 – 3 mm

Makareao

PRODUCT DESCRIPTION

A white porous solid obtained by the calcination of high-purity limestone (CaCO_3) and composed essentially of calcium oxide (CaO).

TYPICAL CHEMICAL PROPERTIES

(ASTM C25, C1271, C1301)

Total Calcium Oxide (CaO) (%)	97.6
Available Calcium Oxide (CaO) (%)	95.9
Magnesium Oxide (MgO) (%)	0.6
Silica (SiO_2) (%)	0.3
Ferric Oxide (Fe_2O_3) (%)	0.1
Alumina (Al_2O_3) (%)	0.1
Manganese Oxide (MnO) (ppm)	70.7
Total Sulfur (S) (%)	0.03
Loss on ignition (%)	na
Calcium Carbonate (CaCO_3) (%)	na

TYPICAL PHYSICAL PROPERTIES

(ASTM C110, AWWA B202)

Bulk Density	
▲ Loose / Packed, (kg/m^3)	993/1277
▲ Loose / Packed, (lb/ft^3)	62/80
Slaking Rate	
▲ Temperature Rise in 30 sec ($^{\circ}\text{C}$)	36.2
▲ Temperature Rise in 3 min ($^{\circ}\text{C}$)	50.5
▲ Total Temperature Rise ($^{\circ}\text{C}$)	51.5
▲ Total Active Slaking Time (min)	3.6

CLASSICAL REFERENCE DATA

(CRC Handbook of Chemistry and Physics)

Specific Gravity	3.25 – 3.38
Solubility in Water (10 $^{\circ}\text{C}$) (g/l)	1.31
pH (saturated solution) (25 $^{\circ}\text{C}$)	12.454
Melting point ($^{\circ}\text{C}$)	2613
Hardness (Mohs)	2 – 3
Specific Heat (0 $^{\circ}\text{C}$) ($\text{cal/g}^{\circ}\text{C}$)	0.17
Heat of solution (cal/g)	844 – 847

SIZE DISTRIBUTION

(ASTM MNL32)

<u>Sieve (mm)</u>	<u>Sieve (U.S.A.)*</u>	<u>% Passing</u>
4.75	No. 4	100.0
3.35	No. 6	99.3
2.36	No. 8	98.0
1.00	No.18	83.3
0.500	No. 35	65.0
0.125	No.120	31.7

NOTICE

The test data herein is based on average results on production samples. Product shipments are subject to normal variation. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. Product Code: 1065 (Bulk)

*These sieves correspond approximately to those of the metric series.

Safety data sheet

Page: 1/9

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

1. Identification of the substance/mixture and of the company/undertaking

Product identifier

RHEOMAX® 1050

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses: flocculation agent

Details of the supplier of the safety data sheet

Emergency telephone number

International emergency number:

Telephone: +49 180 2273-112

2. Hazards Identification

Label elements

According to Regulation (EC) No 1272/2008 [CLP]

Globally Harmonized System, EU (GHS)

The product does not require a hazard warning label in accordance with GHS criteria.

According to Directive 67/548/EEC or 1999/45/EC

Directive 1999/45/EC ('Preparation Directive')

The product does not require a hazard warning label in accordance with EC Directives.

Classification of the substance or mixtureAccording to Regulation (EC) No 1272/2008 [CLP]

No need for classification according to GHS criteria for this product.

According to Directive 67/548/EEC or 1999/45/EC**Possible Hazards:**

May cause some eye irritation which should cease after removal of the product.

May cause some irritation to the respiratory system if dust is inhaled.

Prolonged contact with the product can result in skin irritation.

This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.

Very slippery when wet.

Other hazardsAccording to Regulation (EC) No 1272/2008 [CLP]**Other Hazards (GHS):**

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition/Information on Ingredients**Mixtures**Chemical nature

polyacrylamide, anionic

4. First-Aid Measures**Description of first aid measures**

Remove contaminated clothing.

If inhaled:

If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

On skin contact:

Wash thoroughly with soap and water.

On contact with eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

On ingestion:

Rinse mouth and then drink plenty of water. Check breathing and pulse. Place victim in the recovery position, cover and keep warm. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

Indication of any immediate medical attention and special treatment needed

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:

If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

carbon oxides, nitrogen oxides

The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Special protective equipment:

Wear a self-contained breathing apparatus.

Further information:

The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.

For large amounts: Contain with dust binding material and dispose of.

Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. Avoid raising dust.

Reference to other sections

Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:

Avoid extreme heat.

Specific end use(s)

For the relevant identified use(s) listed in Section 1 the advice mentioned in this section 7 is to be observed.

8. Exposure Controls/Personal Protection

Control parameters

Components with workplace control parameters

Particles, not otherwise specified, respirable

TWA value 4 mg/m³ (EH40 (UK)), Respirable dust

Particles, not otherwise specified, inhalable

TWA value 10 mg/m³ (EH40 (UK)), Inhalable dust

Exposure controls

Personal protective equipment

Respiratory protection:

Suitable respiratory protection for lower concentrations or short-term effect: Particle filter with medium efficiency for solid and liquid particles (e.g. EN 143 or 149, Type P2 or FFP2)

Hand protection:

Chemical resistant protective gloves (EN 374)

Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):

e.g. nitrile rubber (0.4 mm), chloroprene rubber (0.5 mm), polyvinylchloride (0.7 mm) and other

Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g.

temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:

Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:

light protective clothing

General safety and hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Wearing of closed work clothing is recommended. Hands and/or face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. Physical and Chemical Properties

Information on basic physical and chemical properties

Form:	powder
Colour:	off-white
Odour:	odourless
Melting point:	The substance / product decomposes therefore not determined.
Flash point:	not applicable
Solubility in water:	Forms a viscous solution.
Fire promoting properties:	not fire-propagating

Other information

Bulk density: approx. 0.75 g/cm³

Other Information:

If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:	No corrosive effect on metal.	
Formation of flammable gases:	Start temperature:	220 °C

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Peroxides: 0 %
The product does not contain peroxides.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information**Information on toxicological effects**Acute toxicity

Experimental/calculated data:
LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401)

Irritation

Experimental/calculated data:
Skin corrosion/irritation rabbit: non-irritant (OECD Guideline 404)

Serious eye damage/irritation rabbit: non-irritant

Respiratory/Skin sensitization

Experimental/calculated data:
Non-sensitizing.

Other relevant toxicity information

The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information**Toxicity**

Toxicity to fish:
LC50 (96 h) > 100 mg/l, *Oncorhynchus mykiss* (static)
(under static conditions in the presence of 10 mg/L humic acid)

BASF Safety data sheet according to Regulation (EC) No. 1907/2006
Date / Revised: 20.04.2011
Product: **RHEOMAX® 1050**

Version: 1.0

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

Aquatic invertebrates:
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Elimination information:
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential:
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil (and other compartments if available)

Information on: Anionic polyacrylamide
Assessment transport between environmental compartments:
Adsorption to solid soil phase is expected.

Results of PBT and vPvB assessment

According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): The product does not contain a substance fulfilling the PBT (persistent/bioaccumulative/toxic) criteria or the vPvB (very persistent/very bioaccumulative) criteria.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal Considerations

Waste treatment methods

The UK Environmental Protection (Duty of Care) Regulations (EP) and amendments should be noted (United Kingdom).

Contaminated packaging:
Packs that cannot be cleaned should be disposed of in the same manner as the contents.
Uncontaminated packaging can be re-used.

14. Transport Information

Land transport

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

ADR

Not classified as a dangerous good under transport regulations

RID

Not classified as a dangerous good under transport regulations

Inland waterway transport

ADN

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information**Safety, health and environmental regulations/legislation specific for the substance or mixture**

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), and related guidance, for example, 'COSHH Essentials' (United Kingdom).

Chemical Safety Assessment

Chemical Safety Assessment not yet performed due to registration timelines

16. Other Information

Due to the merger of CIBA and BASF Group all Material Safety Data Sheets have been reassessed on the basis of consolidated information. This may have resulted in changes of the Material Safety Data Sheets. In case you have questions concerning such changes please contact us at the address mentioned in Section I.

Vertical lines in the left hand margin indicate an amendment from the previous version.

If you have any queries relating to this MSDS, its contents or any other product safety related questions, please write to the following e-mail address: product-safety-north@basf.com

BASF Safety data sheet according to Regulation (EC) No. 1907/2006

Date / Revised: 20.04.2011

Version: 1.0

Product: **RHEOMAX® 1050**

(ID no. 30474735/SDS_GEN_GB/EN)

Date of print 21.04.2011

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

SAFETY DATA SHEET

According to Model Work Health and Safety Regulations

Section 1: Identification: Product identifier and chemical identity

1.1. Product identifier

Product name: **METALSORB™ FZA**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Company:

Telephone:

Telefax:

E-mail address:

1.4. Emergency telephone number

24-hour emergency number:

Section 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification according to Model Work Health and Safety Regulations:

Not classified.

2.2. Label elements

Labelling according to Model Work Health and Safety Regulations:

Hazard pictogram(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

Additional elements: None.

2.3. Other hazards

Spills produce extremely slippery surfaces.

For explanation of abbreviations see Section 16.

Section 3: Composition and information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components

Contains no reportable hazardous substances.

Section 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. In case of persistent skin irritation, consult a physician.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Alternatively, rinse immediately with Diphoterine ®. Get prompt medical attention.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. Get medical attention immediately if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

None under normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:

Water. Water spray. Dry powder. Carbon dioxide (CO₂). Foam.

Warning! Spills produce extremely slippery surfaces.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:

Wear self-contained breathing apparatus and protective suit.

Other information:

Spills produce extremely slippery surfaces.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:

Do not touch or walk through spilled material. Spills produce extremely slippery surfaces.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

Do not contaminate water.

6.3. Methods and material for containment and cleaning up

Small spills:

Do not flush with water. Soak up with inert absorbent material. Sweep up and shovel into suitable containers for disposal.

Large spills:

Do not flush with water. Dam up. Soak up with inert absorbent material. Clean up promptly by scoop or vacuum.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

Section 7: Handling and storage

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Renders surfaces extremely slippery when spilled. When using, do not eat, drink or smoke.

7.2. Conditions for safe storage, including any incompatibilities

Freezing will affect the physical condition and may damage the material. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

This information is not available.

Section 8: Exposure controls and personal protection

8.1. Control parameters

Occupational exposure limits:

None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:

Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:

i) Hand protection: PVC or other plastic material gloves. Be aware that liquid may permeate gloves, frequent change is advised. Suitable gloves can be recommended by the glove supplier. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.

ii) Other: Wear coveralls and/or chemical apron and rubber footwear where physical contact can occur. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:

No personal respiratory protective equipment normally required.

d) Additional advice:

Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday. Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- | | |
|----------------------------|--------------------------|
| <i>a) Appearance:</i> | Liquid, yellow, to, red. |
| <i>b) Odour:</i> | Rotten egg-like |
| <i>c) Odour Threshold:</i> | No data available. |

d) pH:	10.0 - 11.5 (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	< -3°C
f) Initial boiling point and boiling range:	> 100°C
g) Flash point:	Does not flash.
h) Evaporation rate:	No data available.
i) Flammability (solid, gas):	Not applicable.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	2.3 kPa @ 20°C
l) Vapour density:	0.804 g/L @ 20°C
m) Relative density:	1.0 - 1.3
n) Solubility(ies):	Completely miscible.
o) Partition coefficient n-octanol/water (log value):	< 0
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
t) Explosive properties:	Not expected to be explosive based on the chemical structure.
u) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

Section 10: Stability and reactivity

10.1. Reactivity

Stable under recommended storage conditions.

10.2. Chemical stability

Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

Protect from frost, heat and sunlight.

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), sulfur oxides (SO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

Section 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	Testing by the inhalation route is inappropriate because exposure of humans via inhalation is unlikely: the substance has no vapour pressure and there is practically no exposure to inhalable aerosols.
Skin corrosion/irritation:	Not irritating. (OECD 404)
Serious eye damage/eye irritation:	Not irritating. (OECD 405)
Respiratory/skin sensitisation:	Not sensitizing to skin. No respiratory sensitization has been observed in the workplace.
Mutagenicity:	By analogy with similar products, this product is not expected to be mutagenic.
Carcinogenicity:	By analogy with similar substances, this substance is not expected to be carcinogenic.
Reproductive toxicity:	By analogy with similar substances, this substance is not expected to be toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.
Aspiration hazard:	No hazards resulting from the material as supplied.

Section 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Pimephales promelas/96 hours $\geq$ 60 mg/L
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours $\geq$ 80 mg/L
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours = 15 - 80 mg/L
Chronic toxicity to fish:	No data available.

<i>Chronic toxicity to invertebrates:</i>	No data available.
<i>Toxicity to microorganisms:</i>	No data available.
<i>Effects on terrestrial organisms:</i>	No data available.
<i>Sediment toxicity:</i>	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

<i>Degradation:</i>	Not readily biodegradable.
<i>Hydrolysis:</i>	Does not hydrolyse.
<i>Photolysis:</i>	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

The product is not expected to bioaccumulate.

<i>Partition co-efficient (Log Pow):</i>	< 0
<i>Bioconcentration factor (BCF):</i>	~0

12.4. Mobility in soil

Information on the product as supplied:

Exposure to soil is not to be expected.

12.5. Other adverse effects

None known.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations.

Recycling:

Store containers and offer for recycling of material when in accordance with the local regulations.

Section 14: Transport information

Land transport (ADG)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

Section 15: Regulatory information

Information on the product as supplied:

Australian Inventory of Chemical Substances (AICS)

All components of this product are either listed on the inventory or are exempt from listing.

Section 16: Any other relevant information

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 9. Physical and chemical properties, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

Model Work Health and Safety Regulations & Code of Practice on Preparation of Safety Data Sheets for Hazardous Chemicals.

Version: 21.01.a

LDMS270A

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Table 1. Guideline value modification algorithms

Table updated 020725 (v4, revised 190326. See version notes below for changes*)

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
Dissolved Aluminium Guideline Values (µg/L)			
	Chronic Al GV		
95% LoP. pH ≤ 6.5	500	pH: ≤ 6.5 (Note 4)	See “Note 4” for basis of change of pH threshold. This reduces set change at this pH transition. Eqn at pH 6.5, H=10, DOC=5 → 160 ug/L
95% LoP. pH > 6.5	exp(0.645×ln(DOC) + 2.255×ln(Hardness) + 1.995×pH + (- 0.284×ln(Hardness)×pH) -9.898) *Note if algorithm is ≤ pH 6.5 use 500.	pH: 6.5 – 8.7 Hardness: 10 – 430 mg/L DOC: 0.08 – 12.3 mg/L	
90% LoP	95% LoP / 0.79		The adjustment factor is calculated from the Canadian chronic SSD.
80% LoP	95% LoP / 0.58		As above
Dissolved Copper Guideline Values (µg/L)			
	Chronic Cu GV		
95% LoP	DGV _{0.5} x (DOC/0.5)^0.70 where DGV _{0.5} = 0.73	pH: 6 – 8.5	
90% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 0.89	Hardness: 2 – 400 mg/L	
80% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 1.4	DOC: 0.1 – 20 mg/L	
	Acute Cu GV		
95% LoP	exp (-6.6 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	pH: 5 – 8.8	
90% LoP	exp (-6.3 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	Hardness: 3.9 – 898 mg/L	
80% LoP	exp (-5.8 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	DOC: 0.1 – 30 mg/L	
Dissolved Iron Guideline Values (µg/L)			
All LoP	1000	All conditions	
Dissolved Zinc Guideline values (µg/L)			
	Chronic Zn GV		
95% LoP	exp(0.947xln(Hardness) - 0.815xpH + 0.398xln(DOC) + 4.63)	pH: 5.7 – 8.1	
90% LoP	95% LoP / 0.67	Hardness: 15 – 399 mg/L	
80% LoP	95% LoP / 0.39	DOC: 0.3 – 22.9 mg/L	
	Acute Zn GV		
95% LoP	exp (2.5 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	pH: 5.4 – 8.5	
90% LoP	exp (2.9 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	Hardness: 14 – 826 mg/L	
80% LoP	exp (3.4 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	DOC: 0.1 – 22 mg/L	
Dissolved Cobalt Guideline values (µg/L)			
	Chronic Co GV		
95% LoP	Exp((0.414xLn(hardness))-1.285)	Hardness range: 52-396 mg/L	CCME (2017). Equations for 90% and 80% protection calculated from CCME chronic data. Note: This has hardness modifier which was not in the ANZECC (2000) guidelines.
90% LoP	Exp((0.414xLn(hardness))-0.427)		
80% LoP	Exp((0.414xLn(hardness))+0.557)		
	Acute Co GV		
95% LoP	95%Chronic CoGV/0.16	Hardness range: 52-396 mg/L	Acute peak estimated based on zinc no effect acute and chronic ratio for index water quality conditions.
90% LoP	95%Chronic CoGV/0.11		
80% LoP	95%Chronic CoGV/0.062		
Dissolved Nickel Guideline values (µg/L)			
	Chronic Ni GV		

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
95% LoP	$11 \times (\text{Hardness}/30)^{0.85}$	Hardness range: 30-400 mg/L. No guidance for pH application range. Normally taken as physiological pH range as used for testing (pH 6.5-8.5)	ANZG (2018) guideline.
90% LoP	$13 \times (\text{Hardness}/30)^{0.85}$		
80% LoP	$17 \times (\text{Hardness}/30)^{0.85}$		
	Acute Ni GV		
95% LoP	$95\% \text{Chronic NiGV}/0.16$	Hardness range: 30-400 mg/L	Acute peak estimated based on zinc no effect acute and chronic ratio for index water quality conditions.
90% LoP	$95\% \text{Chronic NiGV}/0.11$		
80% LoP	$95\% \text{Chronic NiGV}/0.062$		
	Dissolved Manganese Guideline values (µg/L)		
	Chronic Mn GV		
95% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.46))$	Hardness range: 25-670 mg/L Simplified equation for hardness only calculated at pH 7.5. Look-up tables provided for pH 5.8 to 8.4.	CCME (2019). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Note: This has hardness modifier which was not in the ANZECC (2000) guidelines.
90% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.89))$		
80% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 5.38))$		
	Acute Mn GV		
95% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 4.84)))/2.13$	Hardness range: 25-250 mg/L	CCME (2019). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024).
90% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 6.90)))/2.13$		
80% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 7.20)))/2.13$		
	Dissolved Cadmium Guideline values (GVs, µg/L)		
	Chronic Cd GV		CCME (2014)
95% LoP	$10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}$	Hardness range: 17-280 mg/L	CCME (2014). Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection.
90% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 1.84$		
80% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 4.15$		
	Acute Cd GV		
95% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/2.13$	Hardness range: 5.3-360 mg/L	CCME (2014) acute dataset. Equations for 90% and 80% protection calculated from CCME chronic data and used to adjust from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024).
90% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/2.77$		
80% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)})/9.58$		
	Nitrate-N (ANZG – hardness (H)-dependent; guideline)		
	Chronic Nitrate-N GV		
95% LoP	1100 (H<30); 2600 (H30-150); 29,000 (H >150)	Hardness dependent	ANZG (2025a)
90% LoP	1500 (H<30); 4200 (H30-150); 38,000 (H >150)		
80% LoP	2300 (H<30); 7100 (H30-150); 56,000 (H >150)		
	Acute Nitrate-NGV		
	Not available		

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Derivation notes
	Nitrate-N (NPS-FM; standard)		
	Chronic Nitrate-N Standard (median standard)		MfE (2020)
95% LoP	2400		
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	Acute Nitrate-N Standard (95th percentile standard)		
95% LoP	3500		
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	Chronic ammoniacal-N (ANZG guideline)		
95% LoP	1200	pH and temperature dependent. Values at pH 7 and 15°C.	ANZG (2026)
90% LoP	2000		
80% LoP	3600		
	Acute ammoniacal-N (ANZG guideline)		
	Not available		
	Chronic ammoniacal-N (NPS-FM median standard)		
95% LoP	580	pH dependent. Values at pH 7.	
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	Acute ammoniacal-N (NPS-FM 95th percentile standard)		
95% LoP	968	pH dependent. Values at pH 8.	
90% LoP	Below "bottom line"		
80% LoP	Below "bottom line"		
	pH		
	Maintain in range 4.5 – 7.0 for WTP discharge		pH: Upper pH to be confirmed from bryophyte analysis for sites with differing levels of protection.

Note 1: The level of protection (LoP) values are species protection levels based on narrative descriptors from ANZG (2018).

Note 2: The compliance range for pH at Smokestack is 4.5 to 7.0. The equations vary in their calibrated TMF ranges. For monitored water quality values less than the lowest calibrated TMF value the calculated guideline value (GV) will apply to that monitoring occasion.

Note 3: Toxicity modifying factors (TMFs) are pH, hardness (calcium and magnesium concentrations) and dissolved organic carbon (DOC, measured as dissolved purgeable organic carbon (DPOC) in natural waters). For pH, hardness and DOC values exceeding the TMF range use the lowest or highest calculated LoP value (except for dissolved aluminum where a 500 µg/L LoP applies to waters below pH 6.5 for all hardness and DOC concentrations).

Note 4: pH minimum for aluminum is based on the pH transition for Al³⁺ and Al-DOM (dissolved organic matter) binding which have elevated concentrations at lower pH levels. This pH threshold also corresponds to that used in the ANZG (2018) and ANZECC (2000) guidelines for Australia and New Zealand.

***1. Revision (040725):**

1. Correct nickel equation to calculate as µg/L. Input issue with base ANZG GVs used.
2. Corrected all manganese equations with formula error transcribing from Excel.
3. Changed iron to be µg/L to be consistent with all other GVs.

***2. V3 Revision (121125) notes:**

#	Parameter	Change and comments	Reference
1	Cadmium	New parameter. Adjusted protection levels calculated from SSD through chronic and acute data. Often less than the trace analytical detection limit (Level of Quantitation = LOQ) for sites. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	CCME (2014)
2	Copper	Slope change to 0.70. DOC maxima to 20 mg/L. Very little change to base sensitivities at 0.5 mg/L DOC.	ANZG (2025b)
3	Nitrate_ANZG	New toxicity chronic guideline thresholds added	ANZG (2025a)
4	Nitrate_NPS-FM	Chronic (median) and acute (95 th percentile) standards added.	MfE (2020)
5	Ammonia_ANZG	Chronic guideline thresholds added. Note standardized to pH 8.	ANZG (2018e)
6	Ammonia_NPS-FM	Chronic (median) and acute (95 th percentile) standards added. Note standardized to pH 8. pH adjustment table in Appendix.	MfE (2020); MfE (2018)
7	Cobalt	No change. Suggest using the CCME (2019) as interim pending Stubblefield updating and revision of TMFs. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	
8	Nickel	No change. Suggest using the ANZECC (2000) (as currently in ANZG 2018) as interim pending ANZG updating and revision of guideline. Application guidance that the Smokestack site compliance be on an add-to-background basis (see #11 below).	ANZG (2018) retains ANZECC (2000)
9	Iron	Retaining 1000 ug/L for iron for all conditions. This is the threshold for iron floc formation in oxygenated circum-neutral pH waters from US EPA (1986) guidance. A very recent iron toxicity guideline has just been released from ANZG (2025f). A fish (fathead minnow) is the most sensitive in this dataset. Fish not present on the plateaux. Recommend that the suitability of the iron guideline be evaluated against future ecological monitoring. The site-specific water chemistry and hydrological regime is the basis for this recommended approach.	US EPA (1986)
10	pH	The recommended pH range for the WTP discharge is 4.5 to 7.0 based on bryophyte communities (pending completion of final report.	
11	Compliance guidance	Add-to-background approach recommended for Waimangaroa compliance sites (Smokestack and downstream) based on the historic mine AMD inputs. This would apply to trace concentration metals: Zn, Cd, Co, Ni. The AMD inputs are highly variable with flow for pH, hardness, DOC, Al, Zn and other trace metal concentrations. This variability in metal concentrations and TMFs are primary justification for the need to adequately account for the upstream concentration variation. Secondarily, macroinvertebrate monitoring and chemistry indicates these are “Highly disturbed system” sites warranting a 90% LoP. There are no fish present at these sites. Toxicity testing of koura indicates a high tolerance of these metals. Mayfly (Deleatidium) testing shows a high tolerance of Co and Ni at both pH 5.5 and pH 7 acute and chronic exposure periods. Other ESE and MFS sites would use the 95% LoP as the GV for assessments downstream of WTP and by-pass discharges.	

		The consent conditions need to incorporate a removal of Cd, Co, Ni if they are at the trace LOQ for multiple monitoring occasions.	
12	Aluminon testing	Aluminon test proposed to better resolve the bioavailable aluminium fraction for longitudinal stream surveys and for sump monitoring. This testing should also be applied to receiving water dilutions with by-pass sump waters if they are low pH and have high Al concentrations. Conditions to be added to consent conditions.	
13	Equation spreadsheet	Calculates GV's for metals for different TMF conditions. Nitrate-N and ammoniacal-N not in spreadsheet.	

References

ANZG 2025b Toxicant default guideline values for aquatic ecosystem protection: Dissolved copper in freshwater, p. 56, Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2025a Toxicant default guideline values for aquatic ecosystem protection: Nitrate in freshwater, p. 35, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2025f Toxicant default guideline values for aquatic ecosystem protection: Iron in freshwater, p. 36, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, CC BY 4.0, Australian and New Zealand governments and Australian state and territory governments.

ANZG 2018e Ammonia in freshwater and marine water (<https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/toxicants/ammonia-2000>), Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

CCME 2014 Canadian water quality guidelines for the protection of aquatic life: Cadmium. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, p. 11, Canadian Council of Ministers of the Environment, Winnipeg, Canada.

MfE 2020c National Policy Statement for Freshwater Management 2020 - October 2024, p. 75, Ministry for the Environment, Wellington.

MfE 2018 A Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management (as amended 2017), p. 47, Ministry for the Environment, Wellington.

US EPA 1986 Quality criteria for water (Gold book) 1986, p. 395, United States Environmental Protection Agency, Office of Water, Regulation and Standards Division, Washington D.C.

Revision v4, 190326

#	Parameter	Change and comments	Reference
1	Ammonia	New ammoniacal-N guidelines added for toxicity. pH and temperature dependent. Table has Values at pH 7 and 15°C. Reference and tables in Appendix B.	ANZG 2026
2	Ammonia	NPS-FM standards. Adjusted to pH 7 to be comparable with the new ANZG (2026)	
3	Spreadsheet	Updated	
4		Calculations tables 6-1 and 6-2 as in Hickey (2026a) in Appendix C	
5	Turbidity guidelines	Changes (in bold): +5 NTU median above background "Now "Performance". Has 25 NTU 15-sample rolling median The 15-sample allows for variable sampling intensity.	

MfE (2018) A Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management (as amended 2017). p. 47. Ministry for the Environment, Wellington.

Appendix – Ammonia adjustment calculations

ANZECC (2000, Section 8.3.7.2) observes that total ammoniacal nitrogen, $\text{NH}_4\text{-N}$ (often referred to as 'total ammonia'), 'refers to two chemical species that are in equilibrium in water: the un-ionised ammonia, NH_3 , and the ionised ammonium ion, NH_4^+ .' And, 'The proportion of the two chemical forms varies with the physico-chemical properties of the water, particularly pH and temperature.'

However, as the name 'total ammonia' implies, the combined amount of these two chemical species is constant, and it does not vary with the physico-chemical properties of the water. That is, 'adjusting' the ammonia concentration for pH does not mean that the amount of total ammonia present changes (and in fact the standard laboratory analysis for $\text{NH}_4\text{-N}$ is successfully carried out at a high pH, e.g. pH 11).

Instead, pH adjustment means calculating the amount of $\text{NH}_4\text{-N}$ at pH 8 that would have the equivalent toxicity to the amount of $\text{NH}_4\text{-N}$ measured in the sample at the pH of the sample – whatever that may have been. That is, the calculation produces the concentration of $\text{NH}_4\text{-N}$ which at pH 8 would have the same toxicity as the observed (ie, unadjusted) $\text{NH}_4\text{-N}$ concentration would have at the observed pH.

The information in table 10 allows the ammonia concentration of a sample to be converted to an equivalent concentration at pH 8 using the following equation:

$$\text{Conc}_{\text{pH } 8} = \frac{\text{Conc}_{\text{pH sample}}}{\text{Ratio}} \quad \text{Equation (1)}$$

Where $\text{Conc}_{\text{pH sample}}$ is the concentration of the sample and Ratio is read from table 10 for the given sample pH.

For example, if a sample was observed with 1.12 mg $\text{NH}_4\text{-N/L}$ at pH 7.5, the adjusted concentration to use in calculating sample statistics would be 0.63 mg $\text{NH}_4\text{-N/L}$ at pH 8. This is derived as follows:

Using equation (1) and table 10:

$$\text{Conc}_{\text{pH } 8} = 0.63 = \frac{1.12}{1.79}$$

Where the numerator (1.12) is the observed sample concentration and the denominator (1.79) is the Ratio from table 10 at pH of 7.5.

That is, although there is still 1.12 mg/L of $\text{NH}_4\text{-N}$ present in the sample, the adjustment process has identified that the toxicity of this sample at pH 7.5 is equivalent to the toxicity associated with a $\text{NH}_4\text{-N}$ concentration of 0.63 mg/L at pH 8. It's the equivalent toxicity that has been adjusted, and not the amount of $\text{NH}_4\text{-N}$ present in the sample (which remains unchanged).

Note that a method for converting to standard temperature is not currently available.

Table 10: Conversion ratios for pH adjustment of ammonia concentrations

Sample pH	Ratio	Sample pH	Ratio	Sample pH	Ratio
6	2.86	7	2.42	8.1	0.87
6.1	2.84	7.1	2.32	8.2	0.73
6.2	2.82	7.2	2.21	8.3	0.62
6.3	2.80	7.3	2.09	8.4	0.53
6.4	2.77	7.4	1.94	8.5	0.44
6.5	2.73	7.5	1.79	8.6	0.38
6.6	2.70	7.6	1.63	8.7	0.32
6.7	2.64	7.7	1.47	8.8	0.27
6.8	2.59	7.8	1.31	8.9	0.23
6.9	2.51	7.9	1.14	9	0.20
		8	1.00	>9	0.20

Source: Adapted from ANZECC (2000) and Hickey (2014).

Appendix B: ANZG (2026) ammonia toxicity-Temperature and pH tables

ANZG (2026c) Toxicant default guideline values for aquatic ecosystem protection: Ammonia in freshwater. In: *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. CC BY 4.0. p. 47. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

Appendix F section from Hickey (2026):

1.1 Ammoniacal-N

1.1.1 ANZG (2026) – ammoniacal-N pH and temperature correction

The ANZG ammoniacal-N guidelines have recently been updated and include both pH and temperature TMFs (ANZG, 2026c). The DGVs are shown in Table F-29 with pH and temperature look-up tables for 95%, 90% and 80% protection shown in Tables F-30-F-32.

Table F-29: DGV values for total ammoniacal-N in freshwater (Table 4 from ANZG 2026c).

Level of species protection (%)	Default guideline value (mg/L) at pH 7, temperature 20°C	Default guideline value (mg/L) at pH 7.5, temperature 20°C	Default guideline value (mg/L) at pH 8, temperature 20°C
99	0.32	0.24	0.13
95	0.97	0.72	0.40
90	1.6	1.2	0.68
80	3.0	2.3	1.3

^a See Appendix E for ammonia default guideline values applicable to a range of pH and temperatures.

^b The default guideline values were derived using the shinyssdtools (version 0.2.0) software and are reported to 2 significant figures. They are not applicable to waters of low ionic strength (e.g. < 50 µS/cm).

Table F-30: Freshwater 95% LoP values for ammoniacal-N at different pH and temperature values (Table E2 – pH range reduced – from ANZG 2026c).

Table E.2 Freshwater 95% species-protection guideline values for total ammonia (mg/L N) at different pH and temperature

Temp. (°C)	pH															
	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5
10	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.5	1.4	1.3	1.2	1.2
11	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.2	1.1
12	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.2	1.1	1.0
13	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.1	0.99
14	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.0	0.94
15	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.98	0.90
16	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	0.93	0.86
17	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	0.95	0.89	0.82
18	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.13	1.10	1.1	1.0	0.97	0.91	0.85	0.78
19	1.2	1.2	1.2	1.2	1.2	1.15	1.13	1.11	1.09	1.06	1.0	0.98	0.93	0.88	0.82	0.75
20	1.1	1.1	1.1	1.1	1.1	1.09	1.08	1.06	1.03	1.00	0.97	0.93	0.88	0.83	0.78	0.72
21	1.1	1.1	1.1	1.0	1.0	1.03	1.01	0.99	0.97	0.94	0.91	0.87	0.83	0.78	0.73	0.67
22	1.0	1.0	1.0	1.0	1.0	0.99	0.98	0.96	0.94	0.91	0.88	0.84	0.80	0.76	0.71	0.65
23	0.98	0.98	0.97	0.96	0.95	0.94	0.93	0.91	0.89	0.87	0.84	0.80	0.76	0.72	0.67	0.62
24	0.93	0.92	0.92	0.91	0.90	0.89	0.88	0.86	0.84	0.82	0.79	0.76	0.72	0.68	0.63	0.58
25	0.88	0.88	0.87	0.87	0.86	0.85	0.83	0.82	0.80	0.78	0.75	0.72	0.68	0.65	0.60	0.55
26	0.84	0.83	0.83	0.82	0.81	0.80	0.79	0.78	0.76	0.74	0.71	0.68	0.65	0.61	0.57	0.53
27	0.79	0.79	0.78	0.78	0.77	0.76	0.75	0.74	0.72	0.70	0.68	0.65	0.62	0.58	0.54	0.50
28	0.75	0.75	0.74	0.74	0.73	0.72	0.71	0.70	0.68	0.66	0.64	0.61	0.58	0.55	0.51	0.47
29	0.71	0.71	0.70	0.70	0.69	0.68	0.67	0.66	0.64	0.62	0.60	0.58	0.55	0.52	0.48	0.45
30	0.66	0.66	0.66	0.65	0.65	0.64	0.63	0.62	0.60	0.58	0.57	0.54	0.52	0.49	0.45	0.42

Table F-31: Freshwater 905% LoP values for ammoniacal-N at different pH and temperature values (Table E3 – pH range reduced – from ANZG 2026c).

Table E.3 Freshwater 90% species-protection guideline values for total ammonia (mg/L N) at different pH and temperature

Temp. (°C)	pH															
	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5
10	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.6	2.5	2.4	2.3	2.2	2.1	1.9	1.8
11	2.8	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.7
12	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.4	2.4	2.3	2.2	2.2	2.0	1.9	1.8	1.7
13	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.0	1.8	1.7	1.6
14	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.2	2.1	2.1	2.0	1.9	1.8	1.7	1.5
15	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.1	2.1	2.0	1.9	1.8	1.7	1.6	1.5
16	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.8	1.7	1.6	1.5	1.4
17	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.6	1.5	1.4
18	2.1	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.5	1.4	1.3
19	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.5	1.4	1.3
20	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.2
21	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.5	1.4	1.3	1.3	1.2
22	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.3	1.2	1.1
23	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.3	1.2	1.2	1.1
24	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.1	1.0
25	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.1	1.1	0.98
26	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.93
27	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.0	0.97	0.89
28	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	0.99	0.92	0.85
29	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	0.95	0.88	0.81
30	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.95	0.90	0.84	0.77

Table 6-1: Summary of sources for guidelines used in this assessment. See text for details.

Toxicant	Test type	Status	Reference
Aluminium (Al)	Long-term (chronic)	CCME used for pH>6.5 with TMFs	US EPA (2018); CCME (2021)
Cadmium (Cd)	Short-term; Long-term	CCME acute and chronic guidelines used with TMFs.	CCME (2014)
Chromium (Cr(III))	Long-term	Screening guideline ^a	(ANZG, 2026b)
Cobalt (Co)	Short-term; Long-term	CCME used with TMFs	CCME (2017) ^b
Copper (Cu)	Short-term; Long-term	NZ (acute) with TMFs; ANZG (chronic) with TMFs	Gadd et al. (2024) (NZ acute); ANZG (2026a) ^c
Iron (Fe)	Long-term	US EPA used	Brix et al. (2023); ANZG (2025f); CCME (2024); (US EPA, 1986)
Lead (Pb)	Short-term; Long-term	Screening guideline with TMFs	CCME (2020)
Manganese (Mn)	Short-term; Long-term	CCME used with TMFs	CCME (2019)
Nickel (Ni)	Short-term; Long-term	ANZG used with TMFs	ANZG (2018a); Stauber et al. (2021) ^d
Zinc (Zn)	Short-term; Long-term	NZ (acute) used with TMFs; CCME (chronic) used with TMFs	Gadd et al. (2024) (NZ acute); ANZG (2024) ^d ; CCME (2018a); CCME (2018b)

^a Guideline used for screening for PCOCs in WLBM with TMFs (if appropriate).

^b Guideline in process of revision for international application.

^c Updated ANZG used as in final review.

^d ANZG guideline in process of revision but not completed. Draft guideline not used.

Table 6-2: Bioavailability guideline value (GV) equations for chronic GV and acute GV for differing levels of protection (LoP). Toxicity modifier factor (TMF) range for pH, hardness (as CaCO₃) and DOC indicated.

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Reference
Dissolved Aluminium Guideline Values (µg/L)			
	Chronic Aluminium GV		
95% LoP. pH ≤ 6.5	500	pH: ≤ 6.5 (Note 4 for basis of change of pH threshold)	a
95% LoP. pH > 6.5	exp(0.645×ln(DOC) + 2.255×ln(Hardness) + 1.995×pH + (-0.284×ln(Hardness)×pH) -9.898) *Note if algorithm is ≤ pH 6.5 use 500.	pH: 6.5 – 8.7 Hardness: 10 – 430 mg/L DOC: 0.08 – 12.3 mg/L	b
90% LoP	95% LoP / 0.79		b
80% LoP	95% LoP / 0.58		b
Dissolved Copper Guideline Values (µg/L)			
	Chronic Cu GV		
95% LoP	DGV _{0.5} x (DOC/0.5)^0.70 where DGV _{0.5} = 0.73	pH: 6 – 8.5 Hardness: 2 – 400 mg/L DOC: 0.1 – 20 mg/L	c
90% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 0.89		
80% LoP	DGV _{0.5} x (DOC/0.5)^ 0.70 where DGV _{0.5} = 1.4		
	Acute Cu GV		
95% LoP	exp (-6.6 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)	pH: 5 – 8.8 Hardness: 3.9 – 898 mg/L DOC: 0.1 – 30 mg/L	d
90% LoP	exp (-6.3 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
80% LoP	exp (-5.8 + 0.78xpH + 0.58×ln(Hardness) + 0.70×ln(DOC)		
Dissolved Iron Guideline Values (µg/L)			
All LoP	1000	All conditions	e
Dissolved Zinc Guideline values (µg/L)			
	Chronic Zn GV		
95% LoP	exp(0.947xln(Hardness) - 0.815xpH + 0.398xln(DOC) + 4.63)	pH: 5.7 – 8.1 Hardness: 15 – 399 mg/L DOC: 0.3 – 22.9 mg/L	f
90% LoP	95% LoP / 0.62		
80% LoP	95% LoP / 0.35		
	Acute Zn GV		
95% LoP	exp (2.5 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)	pH: 5.4 – 8.5 Hardness: 14 – 826 mg/L DOC: 0.1 – 22 mg/L	g
90% LoP	exp (2.9 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
80% LoP	exp (3.4 - 0.12×pH + 0.6×ln(Hardness) + 0.13×ln (DOC)		
Dissolved Cobalt Guideline values (µg/L)			
	Chronic Co GV		
95% LoP	Exp((0.414xLn(hardness)-1.285)	Hardness range: 52-396 mg/L	h
90% LoP	Exp((0.414xLn(hardness)-0.427)		
80% LoP	Exp((0.414xLn(hardness)+0.557)		
	Acute Co GV		
95% LoP	95%Chronic CoGV/0.16	Hardness range: 52-396 mg/L	i
90% LoP	95%Chronic CoGV/0.11		
80% LoP	95%Chronic CoGV/0.062		
Dissolved Nickel Guideline values (µg/L)			
	Chronic Ni GV		
95% LoP	11x(Hardness/30)^0.85	Hardness range: 30-400 mg/L. No guidance for pH application range. Normally taken as physiological pH range as used for testing (pH 6.5-8.5).	j
90% LoP	13x(Hardness/30)^0.85		
80% LoP	17x(Hardness/30)^0.85		
	Acute Ni GV		
95% LoP	95%Chronic NiGV/0.16	Hardness range: 30-400 mg/L	k
90% LoP	95%Chronic NiGV/0.11		
80% LoP	95%Chronic NiGV/0.062		
Dissolved Manganese Guideline values (µg/L)			
	Chronic Mn GV		
95% LoP	Exp((0.411xLn(hardness)+4.46)	Hardness range: 25-670 mg/L	l

Application (Note 1)	Guideline Value (µg/L) (Note 2)	TMF range (Note 3).	Reference
90% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 4.89))$	Simplified equation for hardness only calculated at pH 7.5. Look-up tables provided for pH 5.8 to 8.4.	
80% LoP	$\text{Exp}((0.411 \times \ln(\text{hardness}) + 5.38))$		
	Acute Mn GV		
95% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 4.84)))/2.13$	Hardness range: 25-250 mg/L	m
90% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 6.90)))/2.13$		
80% LoP	$(\text{Exp}((0.878 \times \ln(\text{hardness}) + 7.20)))/2.13$		
	Dissolved Cadmium Guideline values (GVs, µg/L)		
	Chronic Cd GV		
95% LoP	$10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}$	Hardness range: 17-280 mg/L	n
90% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 1.84$		
80% LoP	$(10^{(0.83 \times \text{LOG}_{10}(\text{Hardness}) - 2.46)}) \times 4.15$		
	Acute Cd GV		
95% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)}) \times 0.47$	Hardness range: 5.3-360 mg/L	o
90% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)}) \times 0.61$		
80% LoP	$(10^{(1.016 \times \text{LOG}_{10}(\text{Hardness}) - 1.71)}) \times 2.1$		
	Nitrate-N (ANZG – hardness (H)-dependent; guideline)		
	Chronic Nitrate-N GV		
95% LoP	1100 (H<30); 2600 (H30-150); 29,000 (H >150)	Hardness dependent	p
90% LoP	1500 (H<30); 4200 (H30-150); 38,000 (H >150)		
80% LoP	2300 (H<30); 7100 (H30-150); 56,000 (H >150)		
	Acute Nitrate-NGV		
	Not available		
	Nitrate-N (NPS-FM; standard)		
	Chronic Nitrate-N Standard (median standard)		
95% LoP	2400		q
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Acute Nitrate-N Standard (95th percentile standard)		
95% LoP	3500		q
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Chronic ammoniacal-N (ANZG guideline)		
95% LoP	1200	pH and temperature dependent. Values at pH 7 and 15°C.	r
90% LoP	2000		
80% LoP	3600		
	Acute ammoniacal-N (ANZG guideline)		
	Not available		
	Chronic ammoniacal-N (NPS-FM median standard)		
95% LoP	580	pH dependent. Values at pH 7.	s
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	Acute ammoniacal-N (NPS-FM 95th percentile standard)		
95% LoP	968	pH dependent. Values at pH 7.	s
90% LoP	Below “bottom line”		
80% LoP	Below “bottom line”		
	pH		
	Maintain in range 4.5 – 7.0 for WTP discharge		t

Note 1: The level of protection (LoP) values are species protection levels based on narrative descriptors from ANZG (2018). Site-specific classification levels for ESE and MFS streams have been developed (Hickey, 2026b).

Note 2: The compliance range for pH at Smokestack is 4.5 to 7.0. The equations vary in their calibrated TMF ranges. For monitored water quality values less than the lowest calibrated TMF value the calculated guideline value (GV) will apply to that monitoring occasion.

Note 3: Toxicity modifying factors (TMFs) are pH, hardness (calcium and magnesium concentrations) and dissolved organic carbon (DOC, measured as dissolved purgeable organic carbon (DPOC) in natural waters).

For pH, hardness and DOC values exceeding the TMF range use the lowest or highest calculated LoP value (except for dissolved aluminum where a 500 µg/L LoP applies to waters below pH 6.5 for all hardness and DOC concentrations).

Note 4: pH minimum for aluminum is based on the pH transition for Al³⁺ and Al-DOM (dissolved organic matter) binding which have elevated concentrations at lower pH levels. This pH threshold also corresponds to that used in the ANZG (2018) and ANZECC (2000) guidelines for Australia and New Zealand.

References: (a) Chronic GV for pH ≤ 6.5 from Hickey (2012) derivation using BLM approach; (b) Chronic GV for 95% LoP from CCME (2021) for pH > 6.5 . Reduced LoPs calculated from CCME chronic dataset. No acute sensitivity data in CCME dataset so no acute GVs calculated; (c) Chronic GVs for copper from ANZG (2026a); (d) Acute GVs for copper from Gadd et al. (2024); (e) Iron GV from Hickey (2012) originating from US EPA (1986) to prevent floc on bed; (f) Chronic GV for zinc from CCME (2018b). Reduced LoPs calculated from CCME chronic dataset; (g) Acute GVs for zinc from Gadd et al. (2024); (h) Chronic GVs for cobalt from CCME (2017). Reduced LoPs calculated from CCME chronic dataset; (i) Acute GVs for cobalt based on CCME (2017) chronic dataset with acute no effect thresholds from acute/chronic ratio from zinc sensitivity Gadd et al. (2024). These Canadian GVs are considered interim with updated GVs being derived with MLR and BLM approaches by Stubblefield based on their earlier publication (Stubblefield et al., 2020); (j) Chronic nickel GVs from ANZG (2018a); (k) Acute GVs for nickel from ANZG (2018a) acute no effect thresholds from acute/chronic ratio from zinc sensitivity Gadd et al. (2024); (l) Chronic manganese GVs from CCME (2019). Reduced LoPs calculated from CCME chronic dataset; (m) Acute manganese GVs calculated from CCME (2019) chronic data adjusted from 95% protection. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al., 2024); (n) Chronic cadmium GVs from CCME (2014). Reduced LoPs calculated from CCME chronic dataset; (o) Acute GVs for cadmium based on CCME (2014) dataset. Adjustment factor of 2.13 converts the acute EC50 to acute no effect based on the zinc ratio (from Gadd et al 2024); (p) Chronic GVs for nitrate from ANZG (2025a); (q) Nitrate standards (chronic and acute for median and 95th percentile compliance, respectively) from MfE (2020c); (r) Chronic ammoniacal-N guidelines from ANZG (2026c), based on ANZECC/ARMCANZ (2000); (s) Ammoniacal-N standards (chronic and acute for median and 95th percentile compliance, respectively) from MfE (2020c). pH adjustment to pH 7 (2.42-times increase from pH 8 default) from MfE (2018); (t) Upper and lower pH range from bryophyte species distribution range for Buller Plateaux streams from Hogsden and Hickey (2025).

Appendix D: Turbidity table as in Hickey 2026a

Table 7-1: Summary of site-specific turbidity guideline values for short- and long-term protection of ecological communities, aesthetic and performance. Proposed compliance locations for Escarpment and Mount Frederick South mine water discharges shown in Appendix E. Allowable compliance assessment exceedance frequencies shown in Appendix K.

Classification/Nominal protection level	Short-term (acute) turbidity (NTU) maximum/limit, exposure period	Long-term (chronic) turbidity (NTU) median/95 th percentile/exposure reporting period
Ecological – continuous ^{a,e}	550 max ^a /200, 7-d rolling median	+5 NTU median above background/+20 NTU 95 th percentile/annual
Ecological – discrete ^{b,e}	550 max ^a	As above
Aesthetic ^{c,e}	n/a	+50% change from background for median and 95 th percentile background; >1.6 m median clarity ^f
Performance ^{d,e}	n/a	25 NTU 15-sample rolling median

^a Continuous monitoring with 10-min logging frequency and targeting >90% data capture after quality control and clean up procedures for reporting period – to exclude potential spurious instrumental values or debris contacting probe. The 7-d rolling median assessed weekly based on telemetered data. Discrete daily sampling should be used for easily accessible sites upstream and downstream of a WTP. Sites must have reliable access for sample collection during high flow events.

^b Discrete compliance assessment will differ with monitoring frequency (see Appendix E).

^c Aesthetic compliance assessment for mine-related effects based on continuous monitoring at plateaux compliance sites and calculated flow adjustment. Weekly or monthly discrete sampling at SH67 to validate upstream monitoring adjustments (Compliance assessment for discrete monitoring sample numbers provided in Appendix K).

^d Proposed limit for “Performance” assumed to be based on weekly or monthly discrete sampling (see Appendix E). Key sites could be assessed based on continuous (10-min averaging) or discrete daily monitoring.

^e All measurements to exclude “extreme event” flood conditions. A proposed 1 in 10-year rainfall event is proposed as an extreme event (see text).

^f A site-specific relationship between turbidity and visual clarity will need to be developed from representative stream samples.