ANALYTICAL REPORT

Accreditation No 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	MGO Environment	Manager	Merene Hwang
Client	BIG BELL GOLD OPERATIONS PTY LTD	Laboratory	SGS Perth Environmental
Address	[redacted]	Address	[redacted]
Telephone		Telephone	
Facsimile		Facsimile	
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Project	**Ad-hoc GNH Pit Sample**	SGS Reference	**PE173355 R0**
Order Number	**177547**	Date Received	12 Jan 2024
Samples	1	Date Reported	22 Jan 2024

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(898/20210).

[redacted]

Parameter	Units	LOR	Sample Number: PE173355.001 Sample Matrix: Water Sample Date: 10/1/24 16:00 Sample Name: Great Northen Highway
pH in water Method: AN101 Tested: 12/1/2024			
pH**	pH Units	0.1	8.5
Conductivity and TDS by Calculation - Water Method: AN106 Tested: 12/1/2024			
Conductivity @ 25 C	µS/cm	2	7300
Total Dissolved Solids (TDS) in water Method: AN113 Tested: 17/1/2024			
Total Dissolved Solids Dried at 175-185°C	mg/L	10	4800
Alkalinity Method: AN135 Tested: 12/1/2024			
Carbonate Alkalinity a CO3	mg/L	1	12
Bicarbonate Alkalinity as HCO3	mg/L	5	140
Total Alkalinity as CaCO3	mg/L	5	130
Chloride by Discrete Analyser in Water Method: AN274 Tested: 15/1/2024			
Chloride, Cl	mg/L	1	2000
Sulfate in water Method: AN275 Tested: 15/1/2024			
Sulfate, SO4	mg/L	1	920

Parameter	Units	LOR	Sample Number PE173355.001 Sample Matrix Water Sample Date 10/1/24 16:00 Sample Name Great Northen Highway
Fluoride by Ion Selective Electrode in Water Method: AN141 Tested: 19/1/2024			
Fluoride by ISE	mg/L	0.1	0.2
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258 Tested: 17/1/2024			
Nitrite Nitrogen, NO_2 as N	mg/L	0.05	<0.05
Nitrate Nitrogen, NO_3 a N	mg/L	0 05	0.89
Metals in Water (Dissolved) by ICPOES Method: AN320 Tested: 16/1/2024			
Calcium, Ca	mg/L	0.2	230
Magne ium, Mg	mg/L	0 1	490
Potassium, K	mg/L	0.1	38
Silicon, Si	mg/L	0.02	20
Sodium, Na	mg/L	0.5	750
Total Hardness by Calculation	mg CaCO3/L	1	2600
Trace Metals (Dissolved) in Water by ICPMS in mg/L Method: AN318 Tested: 15/1/2024			
Aluminium, Al	mg/L	0.005	<0.005
Arsenic, As	mg/L	0.001	0.34
Cadmium, Cd	mg/L	0.0001	<0.0001
Chromium, Cr	mg/L	0.001	0.006
Cobalt, Co	mg/L	0.001	0.005
Copper, Cu	mg/L	0.001	<0.001
Iron, Fe	mg/L	0.005	<0.005
Lead, Pb	mg/L	0.001	<0.001
Manganese, Mn	mg/L	0.001	<0.001
Nickel, Ni	mg/L	0.001	0.004
Selenium, Se	mg/L	0.001	0.021
Zinc, Zn	mg/L	0.005	<0.005

Parameter	Units	LOR	Sample Number: PE173355.001 Sample Matrix: Water Sample Date: 10/1/24 16:00 Sample Name: Great Northen Highway
Mercury (dissolved) in Water Method: AN311(Perth)/AN312 Tested: 16/1/2024			
Mercury	mg/L	0.00005	<0.00005
Cyanide Forms in Water by CFA Method: AN296 Tested: 15/1/2024			
Weak Acid Dissociable Cyanide (WADCN)	mg/L	0.004	<0.004
Total Cyanide	mg/L	0 004	0 004
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121 Tested: 22/1/2024			
Anion-Cation Balance	%	-100	4.3

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Carbonate Alkalinity a CO3	LB214245	mg/L	1	1		
Bicarbonate Alkalinity as HCO3	LB214245	mg/L	5	<5		
Total Alkalinity as CaCO3	LB214245	mg/L	5	<5	1 - 11%	101%

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Chloride, Cl	LB214231	mg/L	1	<1	0 - 1%	106%	82 - 90%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Conductivity @ 25 C	LB214249	µS/cm	2	<2	0 - 1%	97 - 98%

Cyanide Forms in Water by CFA Method: ME-(AU)-[ENV]AN296

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Weak Acid Dissociable Cyanide (WADCN)	LB214237	mg/L	0.004	<0.004	0%	103 - 104%	95%
Total Cyanide	LB214237	mg/L	0.004	<0.004	0 - 2%	90 - 92%	79%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Fluoride by ISE	LB214433	mg/L	0.1	<0.1	2%	103%	86%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB214274	mg/L	0.00005	<0.00005	0 - 11%	105 - 106%	95 - 101%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB214282	mg/L	0 2	0 2	0%	97%	92%
Magnesium, Mg	LB214282	mg/L	0.1	<0.1	0 - 1%	103%	100%
Potassium, K	LB214282	mg/L	0.1	<0.1	0 - 4%	99%	89%
Silicon, Si	LB214282	mg/L	0.02	<0.02		109%	119%
Sodium, Na	LB214282	mg/L	0.5	<0.5	0 - 1%	101%	96%
Total Hardness by Calculation	LB214282	mg CaCO3/L	1	<1			

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrite Nitrogen, NO_2 as N	LB214309	mg/L	0.05	<0.05	0%	101%
Nitrate Nitrogen, NO_3 as N	LB214309	mg/L	0.05	<0.05	3%	NA

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB214249	pH Units	0.1	5.7 - 5.8	0 - 1%	100%

Sulfate in water Method: ME-(AU)-[ENV]AN275

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sulfate, SO4	LB214231	mg/L	1	<1	0%	106 - 109%	93 - 96%

Total Dissolved Solids (TDS) in water Method: ME (AU) [ENV]AN113

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Total Dissolved Solids Dried at 175-185°C	LB214286	mg/L	10	<10	0 - 2%	87%	96%	2%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Trace Metals (Dissolved) in Water by ICPMS in mg/L Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB214217	mg/L	0 005	0 005	22%	96%	
Arsenic, As	LB214217	mg/L	0.001	<0.001	0 - 4%	111%	116%
Cadmium, Cd	LB214217	mg/L	0.0001	<0.0001	27 - 35%	104%	98%
Chromium, Cr	LB214217	mg/L	0.001	<0.001	2 - 49%	94%	93%
Cobalt, Co	LB214217	mg/L	0.001	<0.001	2%	96%	
Copper, Cu	LB214217	mg/L	0.001	<0.001	2 - 18%	108%	105%
Iron, Fe	LB214217	mg/L	0.005	<0.005	45%	107%	
Lead, Pb	LB214217	mg/L	0.001	<0.001	7 - 24%	108%	102%
Manganese, Mn	LB214217	mg/L	0.001	<0.001	1%	91%	
Nickel, Ni	LB214217	mg/L	0.001	<0.001	5 - 16%	103%	106%
Selenium, Se	LB214217	mg/L	0 001	0 001	1 199%	96%	115%
Zinc, Zn	LB214217	mg/L	0.005	<0.005	11 - 31%	120%	103%

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN113	The Total Dissolved Solids residue may also be ignited at 550 C and volatile TDS (Organic TDS) and non-volatile TDS (Inorganic) can be determined.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN121	The sum of cations and anions in mg/L may also be reported. This sums Na, K, Ca, Mg, NH3, Fe, Cl, Total Alkalinity, SO4 and NO3.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination , in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN258	Nitrate and Nitrite by FIA: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN274	Chloride by Discrete Analyse: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN275	Sulfate by Discrete Analyse: sulfate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulfate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.
AN296	This method is applicable to the determination of free, total and weak acid dissociable cyanide in drinking water, soil and domestic and industrial waste of a variety of matrices by using San++ continuous flow analysis

METHOD	METHODOLOGY SUMMARY
AN311(Perth)/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
Calculation	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported . APHA4500CO2 D.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

ANALYTICAL REPORT

Accreditation No 2562

CLIENT DETAILS

Contact	MGO Environment
Client	BIG BELL GOLD OPERATIONS PTY LTD
Address	[redacted]
Telephone	
Facsimile	
Email	
Project	**Bluebird Comprehensive Tailings Analysis**
Order Number	**180691**
Samples	1

LABORATORY DETAILS

Manager	Merene Hwang
Laboratory	SGS Perth Environmental
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SGS Reference	**PE175379 R0**
Date Received	24 Apr 2024
Date Reported	03 May 2024

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(898/20210).

Hexavalent Chromium by DA: Limit of reporting raised due to matrix interference.
Metals: LORs raised due to sample matrix interference.
Metals: The over range results on ICPMS Method AN318 were reported using ICPOES method AN320.

[redacted]

Parameter	Units	LOR	Sample Number PE175379.001 Sample Matrix Water Sample Date 23/4/24 13:00 Sample Name Bluebird Tailings
pH in water Method: AN101 Tested: 24/4/2024			
pH**	pH Units	0.1	**9.6**
Conductivity and TDS by Calculation - Water Method: AN106 Tested: 24/4/2024			
Conductivity @ 25 C	µS/cm	2	**16000**
Total Dissolved Solids (TDS) in water Method: AN113 Tested: 3/5/2024			
Total Dissolved Solids Dried at 175-185°C	mg/L	10	**11000**
Trace Metals (Dissolved) in Water by ICPMS in mg/L Method: AN318 Tested: 26/4/2024			
Antimony, Sb	mg/L	0 001	**1.7**
Arsenic, As	mg/L	0.001	**0.35**
Boron, B	mg/L	0.005	**0.28**
Cadmium, Cd	mg/L	0.0001	<0.0050↑
Chromium, Cr	mg/L	0.001	<0.050↑
Cobalt, Co	mg/L	0 001	**0.23**
Copper, Cu	mg/L	0.001	**8.2**
Iron, Fe	mg/L	0.005	**0.36**
Lead, Pb	mg/L	0.001	<0.050↑
Manganese, Mn	mg/L	0.001	<0.050↑
Nickel, Ni	mg/L	0 001	**48**
Selenium, Se	mg/L	0.001	**0.051**
Thallium, Tl	mg/L	0.001	<0.050↑
Zinc, Zn	mg/L	0.005	**1.5**

Parameter	Units	LOR	Sample Number PE175379.001 Sample Matrix Water Sample Date 23/4/24 13:00 Sample Name Bluebird Tailings
Mercury (dissolved) in Water Method: AN311(Perth)/AN312 Tested: 29/4/2024			
Mercury	mg/L	0.00005	**0.79**
Metals in Water (Dissolved) by ICPOES Method: AN320 Tested: 26/4/2024			
Calcium, Ca	mg/L	0.2	**940**
Magne ium, Mg	mg/L	0 1	**9.0**
Potassium, K	mg/L	0.1	**100**
Sodium, Na	mg/L	0.5	**2700**
Total Hardness by Calculation	mg CaCO3/L	1	**2400**
Hexavalent Chromium in water by Discrete Analyser Method: AN283 Tested: 29/4/2024			
Hexavalent Chromium, Cr6+	mg/L	0.001	<0.002↑
Alkalinity Method: AN135 Tested: 1/5/2024			
Carbonate Alkalinity as CO3	mg/L	1	**89**
Bicarbonate Alkalinity as HCO3	mg/L	5	<5
Sulfate in water Method: AN275 Tested: 30/4/2024			
Sulfate, SO4	mg/L	1	**1700**

Parameter	Units	LOR	Sample Number PE175379.001 Sample Matrix Water Sample Date 23/4/24 13:00 Sample Name Bluebird Tailings
Chloride by Discrete Analyser in Water Method: AN274 Tested: 30/4/2024			
Chloride, Cl	mg/L	1	4700
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: AN258 Tested: 26/4/2024			
Nitrate Nitrogen, NO_3 as N	mg/L	0.05	76
Nitrite, NO_2 a NO_2	mg/L	0 2	7.9
Nitrate, NO_3 as NO_3	mg/L	0.2	340
Cyanide Forms in Water by CFA Method: AN296 Tested: 30/4/2024			
Weak Acid Dissociable Cyanide (WADCN)	mg/L	0.004	150
Total Cyanide	mg/L	0.004	220

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB
Carbonate Alkalinity a CO3	LB217400	mg/L	1	1
Bicarbonate Alkalinity as HCO3	LB217400	mg/L	5	<5

Chloride by Discrete Analyser in Water Method: ME (AU) [ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Chloride, Cl	LB217338	mg/L	1	<1	0 - 5%	106%	107%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Conductivity @ 25 C	LB217344	µS/cm	2	<2	1 - 2%	95 - 96%

Cyanide Forms in Water by CFA Method: ME-(AU)-[ENV]AN296

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Weak Acid Dissociable Cyanide (WADCN)	LB217323	mg/L	0.004	<0.004		107%
Total Cyanide	LB217323	mg/L	0.004	<0.004	0%	91%

Hexavalent Chromium in water by Discrete Analyser Method: ME-(AU)-[ENV]AN283

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Hexavalent Chromium, Cr6+	LB217309	mg/L	0.001	<0.001	0%	104%	101%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB217268	mg/L	0.00005	<0.00005	45%	109%	110%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB217219	mg/L	0 2	0 2	4%	104%	87%
Magnesium, Mg	LB217219	mg/L	0.1	<0.1	5%	105%	93%
Potassium, K	LB217219	mg/L	0.1	<0.1	2%	104%	90%
Sodium, Na	LB217219	mg/L	0.5	<0.5	4%	99%	74%
Total Hardness by Calculation	LB217219	mg CaCO3/L	1	<1			

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by FIA Method: ME-(AU)-[ENV]AN258

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate Nitrogen, NO_3 as N	LB217228	mg/L	0.05	<0.05	0 - 2%	NA

pH in water Method: ME (AU) [ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB217344	pH Units	0.1	5.6 - 5.7	1 - 2%	100%

Sulfate in water Method: ME-(AU)-[ENV]AN275

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sulfate, SO4	LB217338	mg/L	1	<1	1 - 3%	105 - 107%	98 - 100%

Total Dissolved Solids (TDS) in water Method: ME-(AU)-[ENV]AN113

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Total Dissolved Solids Dried at 175-185°C	LB217393	mg/L	10	<10	0 - 3%	106%	94%	12%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Trace Metals (Dissolved) in Water by ICPMS in mg/L Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Antimony, Sb	LB217213	mg/L	0 001	0 001		93%	
Arsenic, As	LB217213	mg/L	0.001	<0.001	0%	103%	100%
Boron, B	LB217213	mg/L	0.005	<0.005	0 - 1%	120%	-54%
Cadmium, Cd	LB217213	mg/L	0.0001	<0.0001	4%	98%	101%
Chromium, Cr	LB217213	mg/L	0.001	<0.001	4%	111%	102%
Cobalt, Co	LB217213	mg/L	0.001	<0.001	4%	101%	97%
Copper, Cu	LB217213	mg/L	0.001	<0.001	3%	102%	90%
Iron, Fe	LB217213	mg/L	0.005	<0.005	0%	106%	93%
Lead, Pb	LB217213	mg/L	0.001	<0.001	1%	106%	104%
Manganese, Mn	LB217213	mg/L	0.001	<0.001	0%	118%	-627%
Nickel, Ni	LB217213	mg/L	0 001	0 001	4%	108%	97%
Selenium, Se	LB217213	mg/L	0.001	<0.001		102%	
Thallium, Tl	LB217213	mg/L	0.001	<0.001		90%	
Zinc, Zn	LB217213	mg/L	0.005	<0.005	1%	101%	97%

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN113	The Total Dissolved Solids residue may also be ignited at 550 C and volatile TDS (Organic TDS) and non-volatile TDS (Inorganic) can be determined.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN258	Nitrate and Nitrite by FIA: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Without the cadmium reduction only the original nitrite is determined. Reference APHA 4500-NO3- F.
AN274	Chloride by Discrete Analyse: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN275	Sulfate by Discrete Analyse: sulfate is precipitated in an acidic medium with barium chloride. The resulting turbidity is measured photometrically at 405nm and compared with standard calibration solutions to determine the sulfate concentration in the sample. Reference APHA 4500-SO42-. Internal reference AN275.
AN283	Hexavalent Chromium via Discrete Analyser: Soluble hexavalent chromium forms a red/violet colour with diphenylcarbazide in acidic solution. This procedure is very sensitive and nearly specific for Cr6+. If total chromium is also measured the trivalent form of chromium Cr3+ can be calculated from the difference (Total Cr - Cr6+). Reference APHA3500CrB.
AN296	This method is applicable to the determination of free, total and weak acid dissociable cyanide in drinking water, soil and domestic and industrial waste of a variety of matrices by using San++ continuous flow analysis
AN311(Perth)/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.

METHOD	METHODOLOGY SUMMARY
AN318	Determination of elements at trace level in waters by ICP-MS technique, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
Calculation	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported . APHA4500CO2 D.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

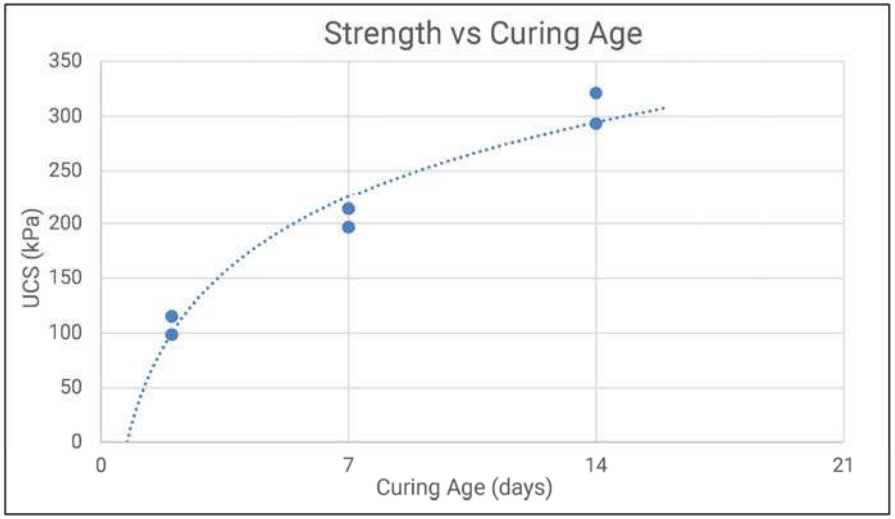
The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

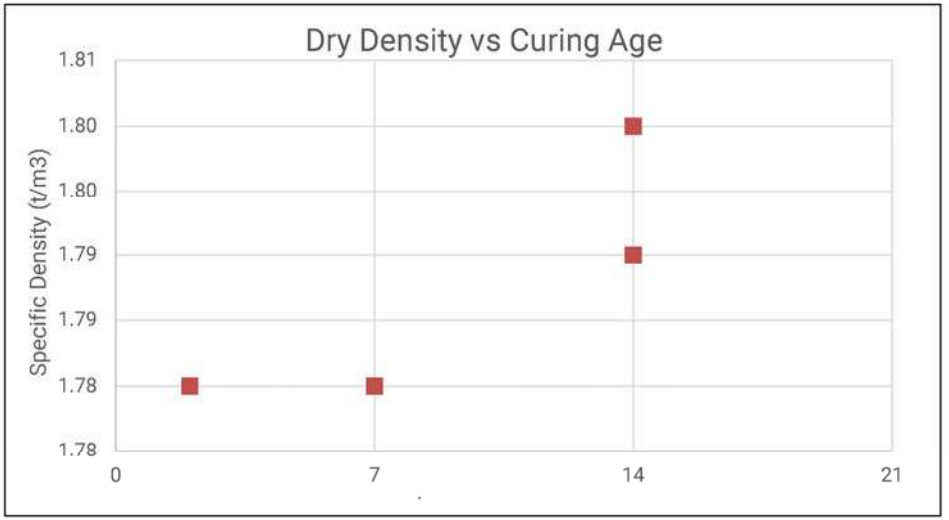
Operational Geotechs

Site	Bluebird
Tailings Source	Bluebird North
Date Batched	29/04/2024
Mix ID	BN - Mix 1

Batch Details	
Cement Content (%)	5.0%
Solids Content (%)	67.5%
Binder Type	LH
Wet Density (t/m3) (prior to curing)	1.97
Yield Stress (Pa)	150.3

Lab Specimens										
Date Tested	1/05/24	1/05/24	6/05/24	6/05/24	13/05/24	13/05/24	27/05/24	27/05/24	24/06/24	24/06/24
Age at test (days)	2	2	7	7	14	14	28	28	56	56
Height of Specimen (mm)	112.4	112.9	109.5	112.0	107.7	109.4	112.9	111.3		
Diameter of specimen (mm)	52.8	52.7	52.8	52.8	52.5	52.8	52.5	52.8		
Moisture Content (%)	43.2	42.4	43.1	43.0	40.9	44.6	43.0	38.0		
Bulk Density (t/m^3)	1.78	1.78	1.78	1.78	1.80	1.79	1.80	1.79		
Compressive Strength										
UCS (kPa)	115	99	214	197	293	321	505	598		

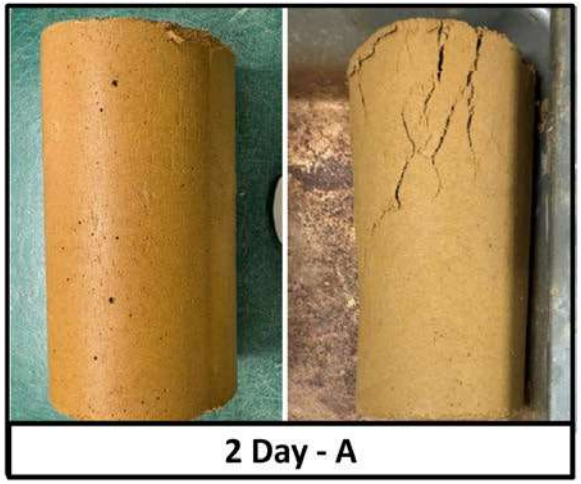




Operational Geotechs

Site	Bluebird
Tailings Source	Bluebird North
Date Batched	29/04/2024
Mix ID	BN - Mix 1

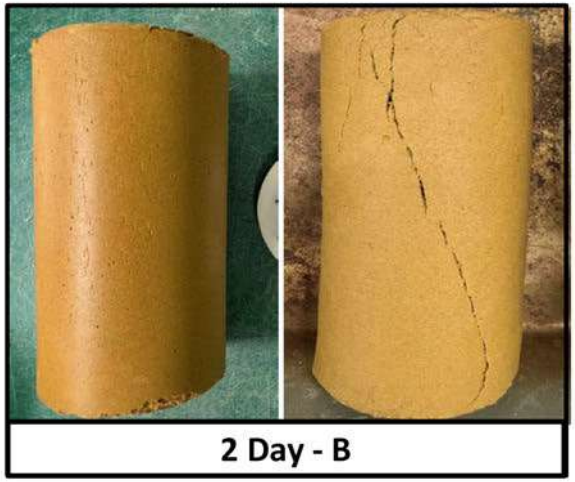
Batch Details	
Cement Content (%)	5.0%
Solids Content (%)	67.5%
Binder Type	LH



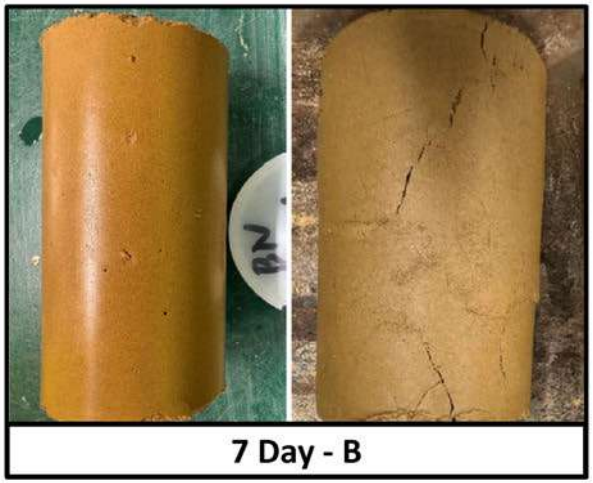
2 Day - A

7 Day - A

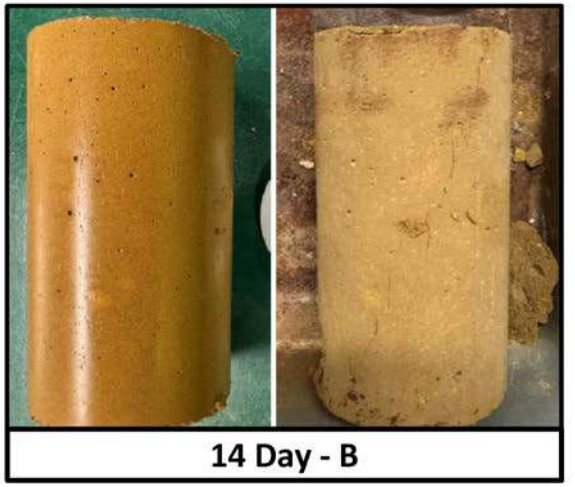
14 Day - A



2 Day - B



7 Day - B



14 Day - B

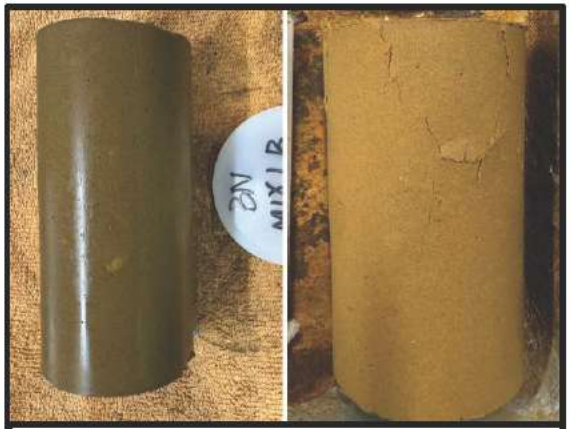
Operational Geotechs

Client	0
Date Batched	0/01/1900
Mix ID	0

Batch Details	
Cement Content (%)	
Solids Content (%)	
Binder Type	

28 Day - A

56 Day - A



28 Day - B

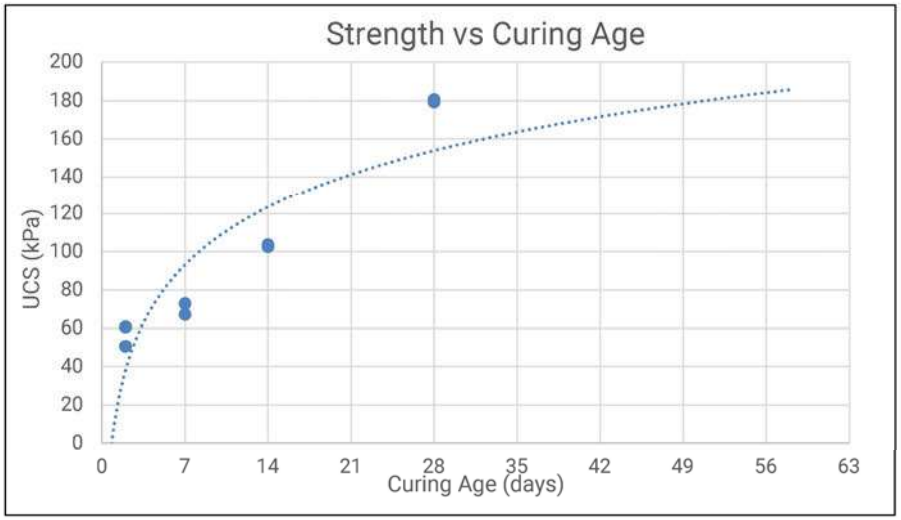
56 Day - B

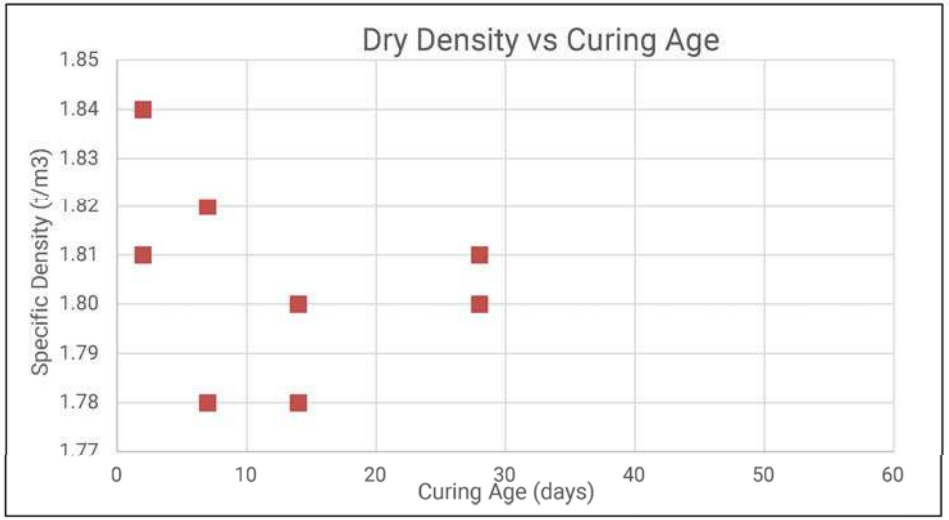
Operational Geotechs

Site	Bluebird
Tailings Source	Bluebird North
Date Batched	29/04/2024
Mix ID	BN - Mix 2

Batch Details	
Cement Content (%)	3.0%
Solids Content (%)	67.5%
Binder Type	LH
Wet Density (t/m3) (prior to curing)	1.95
Yield Stress (Pa)	188.5

Lab Specimens										
Date Tested	1/05/24	1/05/24	6/05/24	6/05/24	13/05/24	13/05/24	27/05/24	27/05/24	24/06/24	24/06/24
Age at test (days)	2	2	7	7	14	14	28	28	56	56
Height of Specimen (mm)	110.9	111.9	110.0	112.2	114.2	110.3	109.3	111.3		
Diameter of specimen (mm)	52.28	52.4	52.6	52.7	52.9	52.8	52.8	52.7		
Moisture Content (%)	43.1	44.4	43.2	44.4	43.0	45.3	42.3	43.0		
Bulk Density (t/m^3)	1.84	1.81	1.82	1.78	1.78	1.80	1.80	1.81		
Compressive Strength										
UCS (kPa)	51	61	67	73	102	104	181	179		

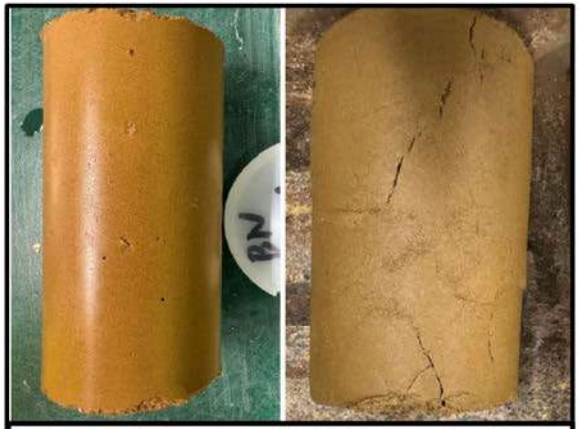




Operational Geotechs

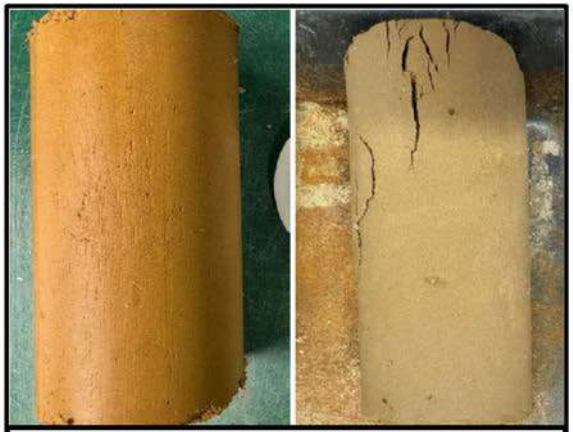
Site	Bluebird
Tailings Source	Bluebird North
Date Batched	29/04/2024
Mix ID	BN - Mix 2

Batch Details	
Cement Content (%)	3.0%
Solids Content (%)	67.5%
Binder Type	LH



2 Day - A

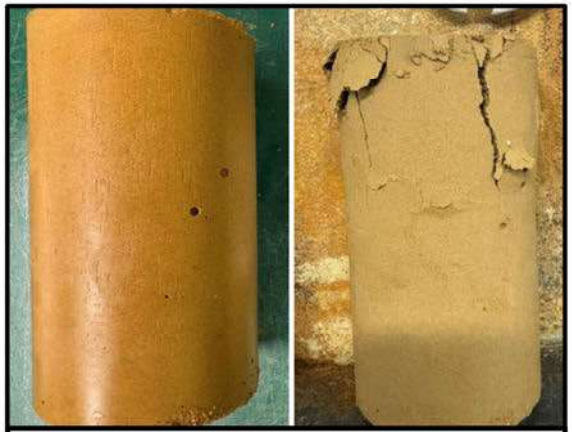
7 Day - A



14 Day - A

2 Day - B

7 Day - B



14 Day - B

Operational Geotechs

Client	0
Date Batched	0/01/1900
Mix ID	0

Batch Details	
Cement Content (%)	
Solids Content (%)	
Binder Type	

28 Day - A

56 Day - A

28 Day - B

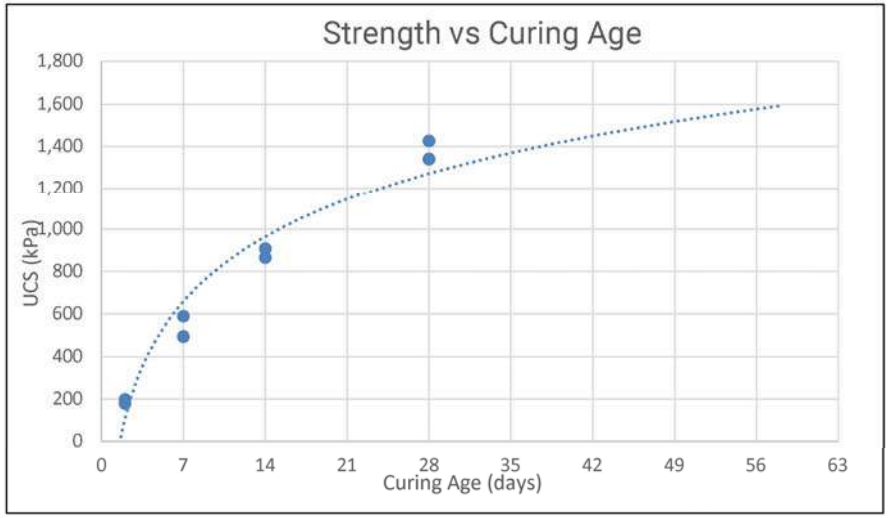
56 Day - B

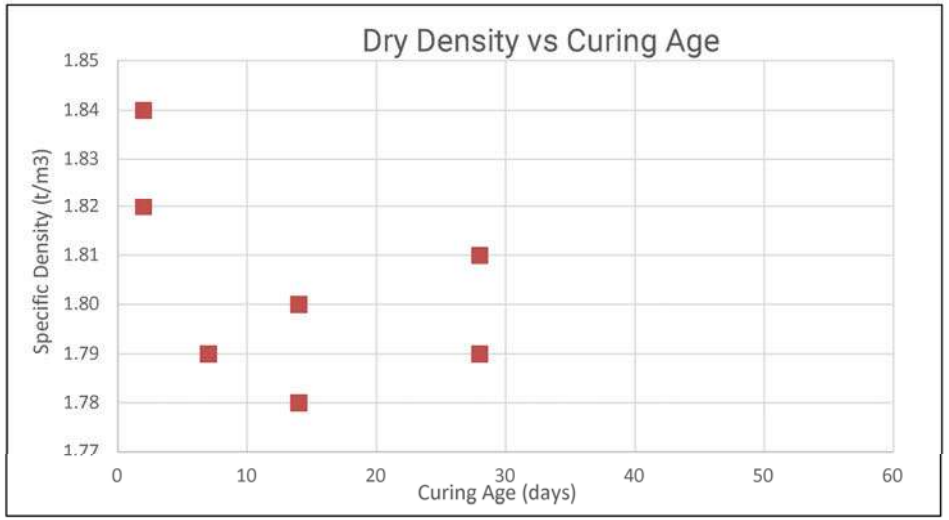
Operational Geotechs

Site	Bluebird
Tailings Source	Bluebird North
Date Batched	29/04/2024
Mix ID	BN - Mix 3

Batch Details	
Cement Content (%)	8.0%
Solids Content (%)	67.5%
Binder Type	LH
Wet Density (t/m3) (prior to curing)	2.00
Yield Stress (Pa)	345.7

Lab Specimens										
Date Tested	1/05/24	1/05/24	6/05/24	6/05/24	13/05/24	13/05/24	27/05/24	27/05/24	24/06/24	24/06/24
Age at test (days)	2	2	7	7	14	14	28	28	56	56
Height of Specimen (mm)	113.9	114.8	111.5	115.3	110.8	111.4	114.3	110.0		
Diameter of specimen (mm)	52.46	52.2	52.9	52.9	52.9	52.9	52.9	52.9		
Moisture Content (%)	35.5	36.1	30.2	27.6	32.4	30.2	39.0	39.4		
Bulk Density (t/m^3)	1.82	1.84	1.79	1.79	1.80	1.78	1.81	1.79		
Compressive Strength										
UCS (kPa)	178	198	495	589	908	866	1,341	1,427		

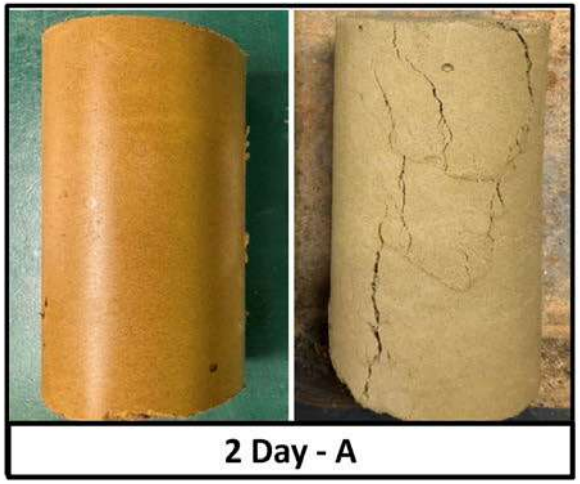




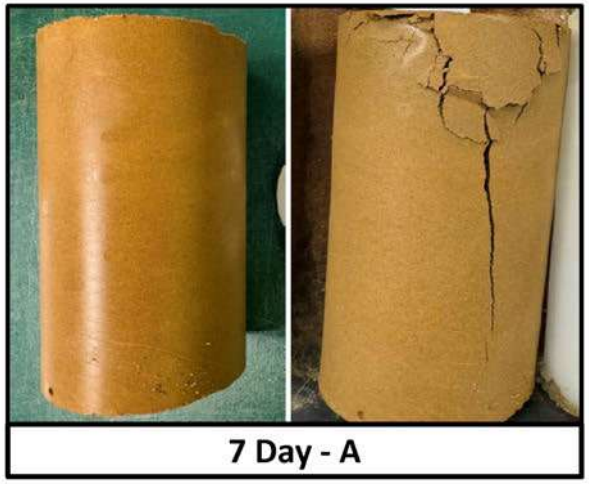
Operational Geotechs

Site	Bluebird
Tailings Source	Bluebird North
Date Batched	29/04/2024
Mix ID	BN - Mix 3

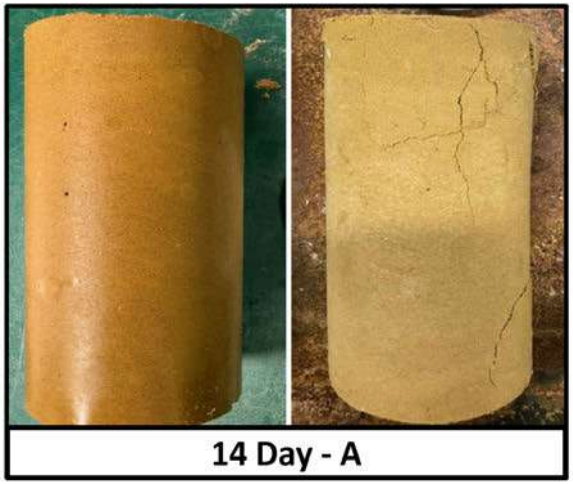
Batch Details	
Cement Content (%)	8.0%
Solids Content (%)	67.5%
Binder Type	LH



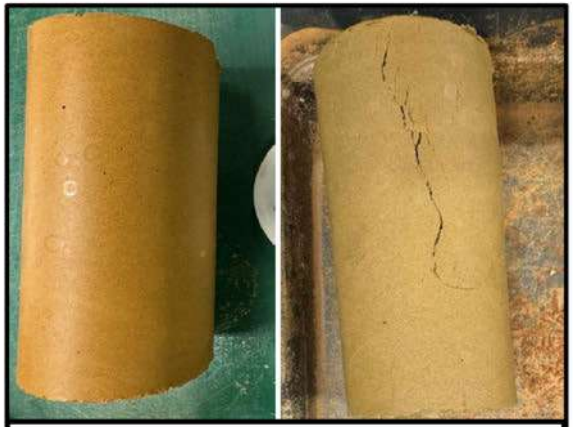
2 Day - A



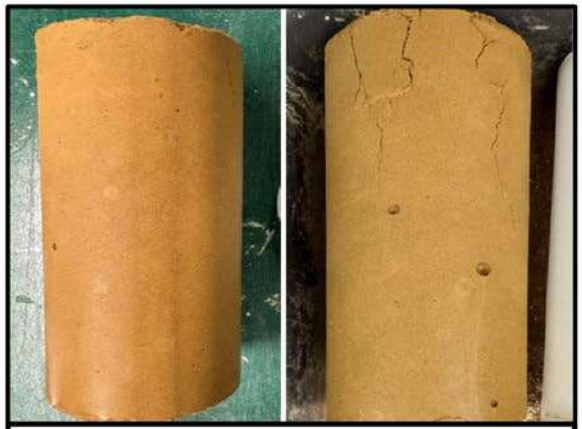
7 Day - A



14 Day - A



2 Day - B



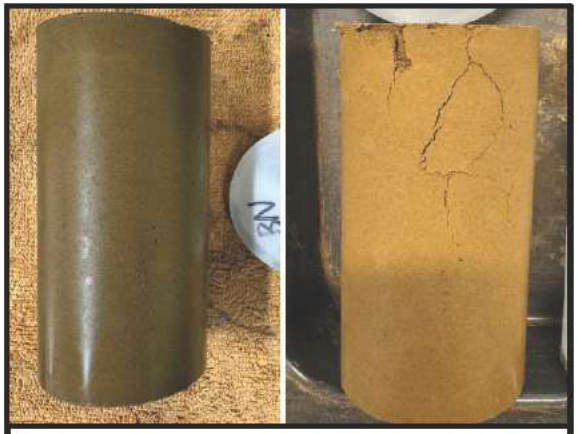
7 Day - B

14 Day - B

Operational Geotechs

Client	0
Date Batched	0/01/1900
Mix ID	0

Batch Details	
Cement Content (%)	
Solids Content (%)	
Binder Type	



28 Day - A

56 Day - A

28 Day - B

56 Day - B