HOLDINGS

INTEGRITY QUALITY SERVICE

MAKGANYANE IRON ORE MINE, NORTHERN CAPE PROVINCE

Waste Classification and Assessment of Expected Waste Rock

RELENTLESSLY PURSUING REAL SOLUTIONS

JULY 11, 2025

DISCLAIMER

The results and conclusions of this report are limited to the Scope of Work agreed between IQS Holdings (Pty) Ltd and the Client for whom this investigation has been conducted. All assumptions made and all information contained within this report and its attachments depend on the accessibility to and reliability of relevant information, including maps, previous reports and word-of-mouth, from the Client and Contractors.

EXECUTIVE SUMMARY

This report presents the waste classification and environmental risk assessment for waste rock anticipated from the proposed Makganyane Iron Ore Mine, situated near Beeshoek and Postmasburg in the Northern Cape Province. Prepared as part of the mine's Environmental Impact Assessment (EIA) process, the primary objective is to evaluate the characteristics, hazard potential, and environmental risk associated with the surface disposal of waste rock generated by mining operations.

The following key findings are submitted:

- **Waste Characterisation and Analysis:**

  Composite geological core samples were subjected to comprehensive analyses, including total elemental concentration via XRF, mineralogical assessment (XRD), acid-base accounting (ABA), net acid generation (NAG) testing, and short-term leaching tests. Results indicate that the waste rock is predominantly composed of quartz and hematite with minor contributions from other minerals.

- **Acid Generation and Leaching Potential:**

  All samples exhibited sulphur concentrations below acid-generating thresholds. Both ABA and NAG tests confirmed that the waste rock is non-acid forming, with net neutralising potential and negligible risk of acid drainage.

- **Leachate Quality:**

  Short-term leach tests, compared to South African Water Quality Guidelines, revealed generally low leachable concentrations for constituents of concern, with all but manganese (in one sample) below relevant guidelines for domestic, irrigation, livestock, and aquatic use.

- **Waste Classification:**

  While certain samples exceeded total concentration thresholds (TCT0) for elements such as Ba, Ni, Co, and Mn—most notably sample MK0240 for Mn—leachable concentrations were consistently below all LCT0 thresholds. According to the amendments to GN R. 635 (as per GN 5522 of 2024), the waste is classified as **Type 4 (non-hazardous)** for landfill disposal.

- **Environmental and Health Risk Assessment:**

  Modelling and risk assessment confirm a low risk of significant impact on surface water, groundwater, and human or ecosystem health due to low rainfall, low leachability, remote water users, and the absence of nearby sensitive ecological receptors.

- **Mitigation and Monitoring:**

  Key recommendations include ongoing groundwater and surface water quality monitoring downstream of the waste rock dump, as well as periodic updates of numerical and geochemical models in line with monitoring data to proactively identify changes in environmental risk.

Conclusion:

The investigation concludes that the proposed waste rock from the Makganyane Iron Ore Mine, when managed with standard engineered barriers and recommended monitoring, presents a low environmental risk and meets the requirements for Type 4 (non-hazardous) waste assessment under current South African waste regulations. The report’s findings support continued authorisation of mining activities, provided the outlined mitigation and monitoring strategies are implemented.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1. INTRODUCTION

This submission is Waste Classification and Assessment (WCA of expected ‘waste rock’ from the proposed Makganyane Iron Ore Mine near Beeshoek and Postmasburg, Northern Cape Province, as part of the EIA process.

This waste classification and risk assessment report documents the characteristics of the expected waste rock, and the potential risk posed to the environment when disposed on surface.

IQS Holdings (Pty) Ltd has been assisted by Herselman Consulting Services in compiling this report.

2. LEGAL FRAMEWORK

2.1 National Water Act (Act 36 of 1998)

Regarding the disposal of mineral residues, the Regulations on Use of Water for Mining and Related Activities, aimed at the Protection of Water Resources (GN R. 704 of 1999) provide for the protection of the water resource in the context of mining and related activities, notably Regulation 7(a) which requires the prevention of water containing waste or any substance which is likely to cause pollution from entering a water resource. The standard that is applied by the Department of Water and Sanitation (DWS) in considering the acceptability of a pollution control barrier system in this regulatory context is either:

- A “compliant design”, which the DWS bases on the Waste Classification and Management Regulations (GN R. 634-636 of 2013), notwithstanding these regulations no longer being applicable in terms of the amended GN R. 632 of 2015; or
- A “risk-based approach” to pollution control barrier design, per the exchange of memoranda between the DWS and the Minerals Council (ref. WULA/1/2016 and EPC/60/16, respectively).

2.2 National Environmental Management: Waste Act (Act no. 59 of 2008)

The management of mine residues (stockpiles and waste deposits) is governed by regulations under the National Environmental Management: Waste Act (Act no. 59 of 2008): Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation (GN R. 632 of 2015), which provide for the characterisation of mine residues (all forms of mine waste and stockpiles) as the basis for a risk assessment.

When promulgated, GN R. 632 of 2015 also provided that the pollution control barrier system be driven by the Waste Classification and Management Regulations (GN R. 634-636 of 2013), based upon the leachable and total concentrations of specified constituents of concern. However, GN R. 632 of 2015 was amended on 21 September 2018, removing the reference to the Waste Classification and Management Regulations, and instead requiring that the pollution control barrier system be driven by a risk assessment based upon the geochemical hazard and toxicology of the waste material and the risk of the water resource and other receptors.

3. APPROACH

The aim of the study was to classify and assess the waste rock expected to arise from the new mine, based on composite exploration drilling core samples and to evaluate the potential risk posed by surface disposal to the receiving environment i.e. groundwater, surface water and aquatic habitat. The risk-based approach towards the risk assessment included the following:

- Characterisation of the tailings;
- Waste classification according to Globally Harmonised System of Classification and Labelling of Chemicals (GHS);
- Waste assessment as a point of reference (GN R. 635 of 2013) as amended by GN 5522 of 2024;
- Evaluate the impact on the receiving groundwater and surface water environment, considering:
  - The vulnerability of the local aquifer(s),
  - The presence of vulnerable ecosystems, and
  - The predicted runoff and seepage chemistry.
- Prevention of pollution to satisfactorily mitigate the impact on groundwater and surface water and on biodiversity.

4. PROJECT DESCRIPTION

The proposed Makganyane Iron Ore Mine is located near Beeshoek, Northern Cape Province. The proposed Mining Right Area will include Portion 2 (A Portion of Portion 1), Remainder Portion, Remainder Portion of Portion 1 and Portion 3 of the Farm Makganyane No. 667 (SAS, 2025). A summary of the environmental setting, taken from SAS (2025) and ZRC (2025), is presented in Table 1.

Table 1: Summary of environmental setting

Climate:	Cold, semi-arid climate. Temperatures typically range between 11°C and 25°C throughout the year, but can drop to -5°C during winter and rise to 38°C in summer
Precipitation:	Summer rainfall (December, January and February) Mean Annual Precipitation (MAP): 300 - 400 mm
Evaporation:	Mean Annual Evaporation (MAE): >2400 mm
Topography:	Located on a ridge
Surface water:	• Orange River Catchment • Quaternary Catchment D73A (Lower Vaal) • Unnamed river within eastern section of site (stream order 1) • Low Mean Ecological Importance • Not considered a watercourse in terms of the NWA (Section 4.2)
Sensitive areas:	Artificial channeled valley bottom wetland, located in the eastern portion of the focus area, associated with the unnamed river
Geology:	Dominated by the Transvaal, Rooiberg & and Griqualand-west formations with iron ore deposits and manganese-rich rocks
Geohydrology:	Regionally, there are two main types of aquifers (Exigo[3], 2018): • Basal and major Ghaap Plateau Dolomite (and banded iron formation)

5. SAMPLING AND ANALYSES

Different geological core samples, obtained during exploration, were used to predict waste rock quality. The sample numbers as well as detail on the depth and geology of the discreet samples used to compile composite samples are indicated in Table 2.

Table 2: Sample numbers

PIT	Composite sample no	Discreet sample depth (m)	Description	Type
1	MK0049	12	Banded Iron formation	Hang Wall
		26.4	Diamictite	Hang Wall
		83.4	Banded Iron formation	Hang Wall
		104.4	Quartzite	Hang Wall
		13443	Banded Shale	Hang Wall
		197.4	Hematite	Ore
		121.4	Hematite	Ore
1	MK0079	11.5	Banded Iron formation	Hang Wall
		26.5	Diamictite	Hang Wall
		50.5	Diamictite	Hang Wall
		68.5	Banded Iron formation	Hang Wall
		80.5	Banded Iron formation	Hang Wall
		86.5	Quartzite	Hang Wall
		98.5	Banded Shale	Hang Wall
		113.5	Carboniferous Shale	Hang Wall
		128.5	Hematite	Ore

PIT	Composite sample no	Discreet sample depth (m)	Description	Type
		134.5	Hematite	Ore
		152.5	Hematite	Ore
		182.5	Chert Breccia	Foot Wall
2	MK0239	8.7	Banded Iron formation	Hang Wall
		44.6	Shale	Hang Wall
		59.6	Quartzite	Hang Wall
		89.6	Hematite	Ore
		95.6	Hematite	Ore
		104.6	Hematite	Ore
		128.6	Hematite	Ore
		140.6	Chert Breccia	Foot Wall
2	MK0240	2	Quartzite	Hang Wall
		12	Shale	Hang Wall
		31.4	Hematite	Ore
		41.65	Chert Breccia	Foot Wall

Samples were submitted to Waterlab (SANAS accredited) for the following analyses:

- XRF whole element analyses (including metals);
- ASLP (deionized water extract) followed by ICP scan, determination of cations and anions including Ca, Cr(VI), Na, K, Mg, SO_4^{2-}, $Cℓ^-$, F^-, NH_4, NO_3 and pH (to determine leachable concentrations of potential constituents of concern).
- Acid base accounting (ABA) and Net acid generation (NAG);
- Sulphur speciation; and
- XRD.

6. MATERIAL CHARACTERISATION

6.1 Total element concentrations

The total element concentrations were determined by XRF is presented in Table 3. These results show that the material consists mainly of silica (quartz), iron oxide, aluminium oxide and potassium oxide while sample MK0240 also contains 5% manganese oxide.

Table 3: Major element concentration of geological core samples

Element		MK0049	MK0079	MK0239	MK0240
		%			
Silica	SiO_2	52.41	52.98	52.85	66.45
Titanium	TiO_2	0.56	0.41	0.54	0.26
Aluminium	Al_2O_3	4.51	6.49	7.47	3.42

Element		MK0049	MK0079	MK0239	MK0240
		%			
Iron	Fe_2O_3	35.41	34.94	34.56	22.39
Manganese	MnO	0.39	0.51	0.25	5.02
Magnesium	MgO	0.96	0.33	0.45	0.18
Calcium	CaO	0.38	0.13	0.17	0.11
Sodium	Na_2O	<0.01	<0.01	<0.01	<0.01
Potassium	K2O	0.91	1.45	1.16	0.73
Phosphorous	P_2O_5	0.19	0.15	0.17	0.11
Chromium	Cr_2O_3	0.06	0.07	0.07	0.04
Sulphur	SO_3	0.64	0.65	0.78	0.72

6.2 Mineralogy

The rock samples were prepared for X-ray Diffraction analysis according to standard analytical methods. The XRD mineral phases and relative phase amounts are indicated in Table 4 and show that the samples consist mainly of quartz and hematite with lesser amounts of other iron-bearing minerals.

Table 4: Mineralogy of rock samples

Mineral	Chemical Formula	MK0049	MK0079	MK0239	MK0240
		Composition %			
Quartz	SiO_2	61.65	55.95	47.69	75.09
Hematite	Fe_2O_3	25.41	29.91	35.56	23.51
Goethite	$Fe_2O_3.2O$	3.33	3	-	-
Microcline	$KAlSi_3O_8$	0.64	-	-	-
Siderite	$FeCO_3$	5.74	-	-	-
Magnesite	$MgCO_3$	-	0.57	-	-
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	-	10.58	8.65	-
Biotite	$K(Mg,Fe)_3AlSi_3O_{10}(OH,F)_2$	1.49	-	-	1.4
Pyrophyllite	$Al_2Si_4O_{10}(OH)_2$	-	-	6.75	-
Chlorite	$(Mg,Fe,Al)_6(Si,Al)_4O_{10}(OH)_8$	1.74	-	1.35	-

6.3 Acid base accounting

The results of acid base accounting (ABA) are aimed at indicating the relative proportions of acid generating and neutralizing elements within a specific sample. The ABA is a static test which does not consider long term mineral kinetics. The ABA results of the core samples are presented in Table 5 and show that the tailings are non-acid forming.

Table 5: ABA results of geological core samples

Sample Number	MK0049	MK0079	MK0239	MK0240
Paste pH	7.36	7.01	7.01	6.97
Total Sulphur (%)	0.059	0.072	0.124	0.128
Sulphate Sulphur as S (%)	0.059	0.067	0.12	0.128
Sulphide Sulphur (%)	<0.010	<0.010	<0.010	<0.010
Acid Potential (AP) (kg/t)	1.84	2.25	3.88	4.0
Neutralization Potential (NP)	3.07	1.98	3.72	2.97
Nett Neutralization Potential (NNP)	1.23	-0.27	-0.16	-1.03
Neutralising Potential Ratio (NPR) (NP:AP)	1.67	0.88	0.96	0.74
Rock Type*	III	II	II	II
* Type I Potentially Acid Forming (Total S(%) > 0.25% and NP:AP ratio 1:1 or less) Type II Intermediate (Total S(%) > 0.25% and NP:AP ratio 1:3 or less) Type III Non-Acid Forming (Total S(%) < 0.25% and NP:AP ratio 1:3 or greater)				

The total sulphur concentrations of all samples were lower than the 0.3% threshold to be considered acid generating.

6.4 Net acid generation

The net acid generation (NAG) test indicates the potential drainage quality of the waste material. A titration value at pH 4.5 indicates acidity due to free acid (i.e. H_2SO_4) as well as soluble Fe and Al. A titration value at pH 7 includes metallic ions that precipitate as hydroxides at pH 4.5-7 (AMIRA, 2002).

The NAG results of the waste material are presented in Table 6. The results indicate that under complete oxidation, the water quality interacting with the rock material will have a pH of 6.3 – 6.5. The results therefore indicate that the waste rock material will be non-acid forming (NAF) under maximum oxidation (NAG at pH 4.5 <0).

Table 6: NAG results of the waste rock material

Sample ID	NAG pH (H_2O_2)	NAG at pH 4.5*	NAG at pH 7.0
	Units	Kg H_2SO_4/t	Kg H_2SO_4/t
MK0049	6.54	<0.01	1.176
MK0079	6.41	<0.01	1.568
MK0239	6.41	<0.01	1.372

Sample ID	NAG pH (H_2O_2)	NAG at pH 4.5*	NAG at pH 7.0
	Units	Kg H_2SO_4/t	Kg H_2SO_4/t
MK0240	6.32	<0.01	1.568

* NAG pH 4.5: NAG (kg H_2SO_4/t) of 0 = Non-acid forming (NAF)
NAG (kg H_2SO_4/t) of 5 = Potentially acid forming – lower capacity (PAF-LC)
NAG (kg H_2SO_4/t) of >5 = Potentially acid forming (PAF)

6.5 Short-term leach tests

Included in the analytical suite was the determination of the leachable fraction of the constituents of concern. The Australian Standard leaching procedure (ASLP) with deionised water extract was conducted to assess the potential drainage quality of the material. The results of ASLP test work were compared to the South African Water Quality Guidelines (DWAF, 1996) to assess the quality of the leachate. Guidelines for domestic use, agricultural use (irrigation and livestock) and aquatic ecosystems were considered.

The constituents of concern in the leachate concentrations of all samples were generally low, in most cases below detection. None of the water quality threshold values were exceeded as shown in Table 7, except the Mn concentration which exceeded the domestic, irrigation and aquatic ecosystems (only MK0240) guidelines.

Table 7: Leachate quality compared to South African Water Quality Guidelines

Constituents of concern	South African Water Quality Guidelines (DWAF, 1996)				Sample numbers			
	Domestic Use	Livestock	Irrigation	Aquatic Ecosystems	MK0049	MK0079	MK0239	MK0240
Units	mg/ℓ							
As	0.01	1	0.1	≤ 0.01	<0.001	<0.001	<0.001	0.002
B	ng	5	0.5	ng	<0.025	<0.025	<0.025	<0.025
Ba	ng	ng	ng	ng	<0.025	0.028	0.158	0.398
Cd	0.005	0.01	0.01	≤ 0.00025	<0.001	<0.001	<0.001	<0.001
Co	ng	1	0.05	ng	<0.025	<0.025	<0.025	<0.025
Cr_{Total}	ng	ng	ng	ng	<0.025	<0.025	<0.025	<0.025
Cr(VI)	0.05	1	0.1	≤ 0.007	<0.010	<0.010	<0.010	<0.010
Cu	1	0.5	0.2	≤ 0.0008**	<0.010	<0.010	<0.010	<0.010
Hg	0.001	0.001	ng	≤ 0.00004	<0.001	<0.001	<0.001	<0.001
Mn	0.05	10	0.02	0.18	0.123	0.129	<0.025	0.449
Mo	ng	0.01	0.01	ng	<0.025	<0.025	<0.025	<0.025
Ni	ng	1	0.2	ng	<0.025	<0.025	<0.025	<0.025
Pb	0.01	0.1	0.2	≤ 0.0005	<0.001	<0.001	<0.001	<0.001

Constituents of concern	South African Water Quality Guidelines (DWAF, 1996)				Sample numbers			
	Domestic Use	Livestock	Irrigation	Aquatic Ecosystems	MK0049	MK0079	MK0239	MK0240
Sb	ng	ng	ng	ng	<0.001	<0.001	<0.001	<0.001
Se	0.02	50	0.02	0.002	<0.001	<0.001	<0.001	<0.001
V	0.1	1	0.1	ng	<0.025	<0.025	<0.025	<0.025
Zn	3	20	1	≤ 0.002	<0.025	<0.025	<0.025	<0.025
Cl	100	1500	ng	ng	2.0	2.0	2.0	7.0
SO_4	200	1000	ng	ng	<2	<2	3.0	4.0
NO_3-N	ng	100	ng	ng	<0.1	<0.1	<0.1	<0.1
F	1	2	2	≤ 0.75	<0.2	<0.2	<0.2	<0.2
pH	6 - 9	ng	6.5-8.4	variation of 0.5 or by 5% from background values allowed	7.37	6.92	7.23	7.03

7. WASTE CLASSIFICATION

The GHS classification is based on the analytical results as well intrinsic properties of the waste streams. The percentage concentration of chemical constituents of the waste material must be screened in terms of physical, human health and environmental hazards as per the cut-off limits presented in Table 8.

Table 8: Hazard classes and associated cut-off concentration limits

Hazard class	Cut-off value (concentration limit) %
Acute toxicity	> 1.0
Skin corrosion	pH ≤ 2 or ≥ 11.5
Skin irritation	pH ≤ 2 or ≥ 11.5
Serious damage to eyes	> 1.0
Eye irritation	> 1.0
Respiratory sensitization	> 1.0
Skin sensitization	> 1.0
Mutagenicity: Category 1 Category 2	> 0.1 > 1.0
Carcinogenicity	> 0.1
Reproductive toxicity	> 0.1
Target organ systemic toxicity	> 1.0
Hazardous to the aquatic environment	> 1.0

The GHS classification of the geological material is as follows:

- Physical hazards – The waste rock materials are not explosive, flammable (combustible through friction), pyrophoric (ignite when in contact with air) or oxidising and does not release toxic gases when in contact with water or acid. Therefore, it is not hazardous in terms of physical characteristics.
- Health hazards – The percentage concentration of constituents obtained from the XRF (Table 3 and Table 9) were compared to the cut-off values/concentration limits for hazard classes summarized in Table 1. The only elements with concentrations
- >1% were silica (SiO_2), aluminum (Al_2O_3), iron (Fe_2O_3), manganese (MnO; only sample MH0240) and K_2O. Silica dust may be harmful to human health, but it is
- Unlikely that the waste rock will generate sufficient dust to impact on human health. No carcinogens or mutagens were present in concentrations >0.1% and the pH of the material is neutral. The geological material (waste rock) does not pose a hazard to human health.
- Environmental hazard – The concentrations of constituents in the leachates are <1% and not likely to be hazardous to the aquatic environment.

8. WASTE ASSESSMENT

The purpose of the waste assessment is to determine the waste Type intended for land disposal. The potential level of risk associated with disposal of waste are determined by following the prescribed and appropriate leach test protocols in terms of the GN R. 635 of 23 August 2013. The analytical results need to be screened against the four levels of thresholds for leachable and total concentrations, which in combination, determines the waste type and associated barrier design / liner requirements. The thresholds for the total concentrations (TC in mg/kg) and leachable concentrations (LC in mg/l) are defined for the set of chemical constituents published in GN R. 635 of 23 August 2013 and Amendments to GN R. 635 (GN 5522 of 2024).

The waste type is defined as follows:

- Type 4: LC ≤ LCT0 and TC ≤ TCT0
- Type 3: LC ≥ LCT0 but ≤ LCT1 and TC ≤ TCT1
- Type 2: LC > LCT1 but ≤ LCT2 and TC ≤ TCT1
- Type 1: LC > LCT2 but ≤ LCT3 or TC > TCT1 ≤ TCT2
- Type 0: LC > LCT3 or TC > TCT2.

Section 7(6) of GN R. 635 (as amended) states that: "*Notwithstanding section 7(2) of these Norms and Standards, waste with all elements or chemical substance leachable concentration levels for metal ions and inorganic anions below or equal to the LCT0 limits are considered to be Type 4 waste, irrespective of the total concentration of elements*…".

A summary of the analytical results of the waste rock are presented in Table 9 total concentrations) - Table 10 (leachable concentrations) below. These results show the following:

- Total Ba and Ni concentrations in all samples were > TCT0 but < TCT1;
- Total Co, Mn and Ni in samples MK0049, MK0079 and MK0239 were > TCT0 but < TCT1;
- Total Mn in sample MK0240 was > TCT1 but <TCT2; and
- Leachable concentrations of all constituents were < LCT0 levels and in most cases below detection.

Although the total concentrations of Ba, Ni, Co, Mn and Ni exceeded TCT0 levels, the low leachable concentrations of all constituents (<LCT0) in the samples results in Type 4 waste according to the GN 5522 of 2024 amendment to GN R. 635.

Table 9: Total concentration of constituents of concern compared to GN R. 635 TCT thresholds

Constituents	TCT0	TCT1	TCT2	MK0049	MK0079	MK0239	MK0240
	mg/kg						
As	5.8	500	2000	<0.43	<0.43	<0.43	<0.43
Ba	62.5	6250	25000	91.4	161	1482	1491
Cd	7.5	260	1040	<3.04	<3.04	<3.04	<3.04
Co	50	5000	20000	77	139	151	<0.56
Cr	46000	800000	N/A	411	479	479	274
Cu	16	19500	78000	<4.19	<4.19	<4.19	<4.19
Hg	0.93	160	640	<1.00	<1.00	<1.00	<1.00
Mn	1000	25000	100000	3 020	3 950	1 936	38 878
Mo	40	1000	4000	<0.51	<0.51	<0.51	1.49
Ni	91	10600	42400	102	99.9	109	89.6
Pb	20	1900	7600	353	344	388	216
Sb	10	75	300	<1.48	<1.48	<1.48	2.8
Se	10	50	200	3.23	2.47	3.15	0.45
V	150	2680	10720	25.2	37	34.3	<7.6
Zn	240	160000	640000	111	100	106	69.1

Notes *Grey: TC >TCT0 but < TCT1; Yellow: TC >TCT1 but < TCT2; Red: TC >TCT2*

Table 10: Leachable (1:20 deionised water ASLP) concentration of constituents of concern compared to GN R. 635 LCT thresholds

Constituents	LCT0	LCT1	LCT2	LCT3	MK0049	MK0079	MK0239	MK0240
	mg/l							
As	0.01	0.5	1	4	<0.001	<0.001	<0.001	0.002
B	0.5	25	50	200	<0.025	<0.025	<0.025	<0.025
Ba	0.7	35	70	280	<0.025	0.028	0.158	0.398
Cd	0.003	0.15	0.3	1.2	<0.001	<0.001	<0.001	<0.001
Co	0.5	25	50	200	<0.025	<0.025	<0.025	<0.025
Cr	0.1	5	10	40	<0.025	<0.025	<0.025	<0.025
Cr(VI)	0.05	2.5	5	20	<0.010	<0.010	<0.010	<0.010
Cu	2.0	100	200	800	<0.010	<0.010	<0.010	<0.010
Hg	0.006	0.3	0.6	2.4	<0.001	<0.001	<0.001	<0.001
Mn	0.5	25	50	200	0.123	0.129	<0.025	0.449
Mo	0.07	3.5	7	28	<0.025	<0.025	<0.025	<0.025
Ni	0.07	3.5	7	28	<0.025	<0.025	<0.025	<0.025
Pb	0.01	0.5	1	4	<0.001	<0.001	<0.001	<0.001
Sb	0.02	1.0	2	8	<0.001	<0.001	<0.001	<0.001
Se	0.01	0.5	1	4	<0.001	<0.001	<0.001	<0.001
V	0.2	10	20	80	<0.025	<0.025	<0.025	<0.025
Zn	5.0	250	500	2000	<0.025	<0.025	<0.025	<0.025
Cl	300	15 000	30 000	120 000	2.0	2.0	2.0	7.0
SO_4	250	12 500	25 000	100 000	<2	<2	3.0	4.0
NO_3-N	11	550	1100	4400	<0.1	<0.1	<0.1	<0.1
F	1.5	75	150	600	<0.2	<0.2	<0.2	<0.2
pH					7.37	6.92	7.23	7.03

Notes: *Grey: LC >LCT0 but <LCT1; Yellow: LC >LCT1 but <LCT2; Orange: LC >LCT2 but <LCT3; Red: LC>LCT3*

9. CONCEPTUAL SITE MODEL

The conceptual site model can be summarised as follows:

- Disposal/storage of Waste Rock on surface;
- Waste rock is non-acid generating and leachability of constituents are low;
- No sensitive ecosystems, wetlands or rivers directly associated with the facility;
- Unnamed stream is located ≈750m from the proposed Waste Rock Dump;
- Depth to groundwater is ≈25 mbgl (no site specific information available);
- Minor aquifer with low yield (DWS Aquifer Classification of South Africa) (no site specific information);

- Groundwater quality impacted by local geology and surrounding mining activities (assumption); and
- Groundwater is used by farmers for domestic purposes and livestock watering.

10. RISK ASSESSMENT

10.1 Methodology

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, 1998) and as amended from time to time (DEAT, 2002): *Methodology for the assessment of the potential environmental, social and cultural impacts* (Appendix B).

The level of detail as depicted in the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) (DEAT, Impact Significance, Integrated Environmental Management, Information series 5., 2002) was fine-tuned by assigning specific values to each impact. To establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. The detailed explanation of the impact assessment criteria is included in Appendix B of this report.

Risk assessment/evaluation is the process of evaluating the extent, duration, intensity and probability (frequency) of consequences and risk occurrences of an activity or exposure. The weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment/receptor. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

The significance rating of potential impacts without mitigation is calculated as follows:

Environmental Significance = Overall consequence *(Severity/Intensity + Duration + Extent/Spatial Scale)/3)* * *Overall likelihood* *(Frequency + Probability)/2)*

The quantitative ratings used for severity, spatial scale, duration, frequency and probability are shown in Table 11.

Table 11: Quantitative ratings for different variables in the risk assessment

Extent/Spatial scale		Duration	
Immediate, fully contained area	1	1 Month	1
Surrounding area	2	1-3 Months (Quarter)	2
Within Business Unit area	3	3 – 12 Months	3
Within the farm/neighbouring farm area	4	1-10 years	4
Regional/National/International	5	>10 years	5
Probability		**Frequency**	
Almost never/almost impossible	1	Once a year or once/more during operation	1
Very seldom / highly unlikely	2	Once/more in 6 months	2
Infrequent / unlikely / seldom	3	Once/more a month	3
Often / regularly / likely / possible	4	Once/more a week	4
Daily / highly likely / definitely	5	Daily	5
Severity			
Insignificant/non-harmful	1		
Potentially harmful	2		
Significant / harmful	3		
Very harmful	4		
Disastrous / extremely harmful	5		

The risk rating classes based on the calculated ratings are shown in Table 12.

Table 12: Overall environmental significance

Environmental Significance	
Low	0 - 4.9
Low to Medium	5 - 9.9
Medium	10 - 14.9
Medium to High	15 - 19.9
High	20 - 25

10.2 Risk assessment outcome

The outcome of the risk assessment, based on the available information, is presented in Table 13 and is based on the following:

- Intensity: Insignificant/non-harmful – analytical data show that constituents in the Waste rock tailings are not leachable/soluble and concentrations are within SA Water Quality standards.
- Extent/Spatial scale: Site and surrounding area only, since off-site migration of the contaminants is unlikely due to low leachability.
- Duration: Short/medium term during construction and long-term during operation and decommissioning. For human and animal health the short-term duration was used since mitigation will eliminate the risk.
- Frequency: Due to low leachability of constituents, the frequency of the impact is considered as once-off;
- Probability: Highly unlikely that the Waste Rock will have an unacceptable impact on the environment due to low leachability of constituents.

The Waste Rock is expected to pose low risk to surface- and groundwater quality due to low leachability of constituents and low rainfall in the area.

10.3 Proposed Mitigation measures

Although the risk associated with the Waste Rock is low, the following mitigation and monitoring interventions are recommended for the proposed activity:

- Monitoring of groundwater quality down-gradient of the Waste Rock Dump;
- Monitoring of water quality in the stream if possible; and
- Numerical and geochemical model need to be updated against monitoring data every 2-3 years to serve as early warning system for potential contamination.

Table 13: Risk assessment outcome

Activity	Receptors	Potential Impact	Overall consequence			Overall likelihood		Environmental Significance
			Severity/Intensity	Duration	Extent/Spatial scale	Frequency	Probability	
Construction	Surface water quality	Contaminated run-off/stormwater into unnamed stream	1	2	2	1	2	2.50
	Groundwater quality	Leaching of contaminants into GW	1	2	1	1	2	2.00
	Human and animal health	Ingestion/use of contaminated groundwater	1	3	2	1	1	2.00
		Ingestion/use of contaminated surface water	1	3	2	1	1	2.00
Operation	Surface water quality	Contaminated run-off/stormwater into unnamed stream	1	4	2	1	2	3.50
	Groundwater quality	Leaching of contaminants into GW	1	4	2	1	2	3.50
	Human and animal health	Ingestion/use of contaminated groundwater	1	3	2	1	1	2.00
		Ingestion/use of contaminated surface water	1	3	2	1	1	2.00
Decommissioning	Surface water quality	Contaminated run-off/stormwater into unnamed stream	1	4	2	1	2	3.50
	Groundwater quality	Leaching of contaminants into GW	1	4	2	1	2	3.50
	Human and animal health	Ingestion/use of contaminated groundwater	1	3	2	1	1	2.00
		Ingestion/use of contaminated surface water	1	3	2	1	1	2.00

11. SUMMARY AND CONCLUSION

The outcome of the risk assessment is summarised in Table 14. The XRF results show that the geological material (waste rock) contains mainly silica (quartz), iron oxide, aluminium oxide and potassium oxide while sample MK0240 also contains 5% manganese oxide. The mineralogical information also shows that the samples exist mainly of quartz and hematite with lesser amounts of other iron-bearing minerals.

The ABA and NAG results show that the waste rock will not be acid forming and the total sulphur concentration of all samples were lower than the 0.3% threshold to be considered acid generating. Under complete oxidation, the water quality interacting with the rock material will have a pH of 6.3 – 6.5.

The core samples contain elevated total Ba, Ni, Co, Mn and Ni concentrations, exceeding the GN R. 635 initial total concentration threshold (TCT0) and TCT1 in sample MK0240. Due to the low leachable concentrations of all constituents (<LCT0), the waste rock is assessed as a Type 4 waste and non-hazardous according to GHS. The short-term leach test show that the constituents are insoluble at the current pH of the material (pH 6.9 – 7.4) and the impact on the receiving environment is expected to be insignificant. The short-term leachate and run-off quality will be compliant with the water quality guidelines for domestic use, agricultural use and for aquatic ecosystems.

No material impacts on the local aquifers and ecosystems are anticipated due to the proposed disposal of the Waste Rock.

Table 14: Waste Rock Risk Assessment summary

Aspect		**Waste Rock**
Chemical	Acid-base accounting	Not acid-generating
	Paste pH	Neutral (6.9-7.4)
	Chemical composition of leachate (short-term)	No exceedances of water quality guidelines, except Mn in sample MK0240
	Propensity to oxidise and decompose, stability and reactivity	Not containing minerals that will react with oxygen and water to produce ARD
	Concentration of volatile organics	Not applicable
Waste classification	Physical hazards	Not hazardous
	Health hazards	Not hazardous
	Environmental hazard	Not hazardous
	Classification	Not hazardous in terms of GHS
	Total concentrations	TC > TCT0 (Ba, Ni, Co, Mn and Ni) TC > TCT1 (Mn) in sample MK0240
	Leachable concentrations	LC < LCT0 for all constituents

Aspect		**Waste Rock**
	Assessment	Type 4 waste, due to low leachable concentrations (LC< LCT0)
Toxicity	Ecotoxicology	Not ecotoxic (low leachability)
Presence of vulnerable ecosystems		Artificial channelled valley bottom wetland, located in the eastern portion of the focus area, associated with the unnamed river
Mitigation measures to manage the impact on receiving environment		Continuous surface- and groundwater monitoring Regular updates of numerical and geochemical model

12. LIST OF REFERENCES

Department of Environmental Affairs, 2002. Environmental Impact Assessment Guidelines: Impact significance, Integrated Environmental Management, Information series 5.

Methodology for the assessment of the potential environmental, social and cultural impacts. The Government Printing Works: Pretoria.

Department of Environmental Affairs, 2013. Government Gazette, Government Notice R634. National Environmental Management: Waste Act (59/2008): Waste Classification and Management regulations. The Government Printing Works: Pretoria.

Department of Environmental Affairs, 2013. Government Gazette, Government Notice R635. National Norms and standards for the assessment of waste for landfill disposal. The Government Printing Works: Pretoria.

Department of Forestry, Fisheries and the Environment, 2024. Government Gazette, Government Notice 5522. Amendments to the National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013. Government Gazette No. 51520, 7 November 2024. The Government Printing Works: Pretoria.

Department of Forestry, Fisheries and the Environment, 2024. Government Gazette, Government Notice 5524. Amendments to the Waste Classification and Management Regulations, 2013. Government Gazette No. 51522, 7 November 2024. The Government Printing Works: Pretoria.

Department of Water Affairs and Forestry (DWAF), 1996. South African Water Quality Guidelines (second edition). Volume 1: Domestic Use

Department of Water Affairs and Forestry (DWAF), 1996. South African Water Quality Guidelines (second edition). Volume 4: Agricultural Use: Irrigation

Department of Water Affairs and Forestry (DWAF), 1996. South African Water Quality Guidelines (second edition). Volume 5: Agricultural Use: Livestock Watering

Department of Water Affairs and Forestry (DWAF), 1996. South African Water Quality Guidelines. Volume 7: Aquatic Ecosystems.

Department of Water Affairs and Forestry (DWAF), 2012. Directorate: Hydrological Services, Sub-Directorate: Groundwater Information. Aquifer Classification of South Africa (August 2012). https://www.dws.gov.za/Groundwater/documents/Aquifer%20Classification.pdf (accessed 24 June 2025).

Globally Harmonized System of Classification and Labelling of Chemicals (GHS). 10th Revised Edition. United Nations, 2023.

Exigo[3], 2018. Tshiping Water Users Association Catchments D41J & D73A Phase B.2.B – Regional groundwater data - resource impacts and management: Groundwater specialist report. Report number ES15/205 V3.

Fouche, C.,2024. DFFE Screening Report for an Environmental Authorisation as required by the 2014 EIA Regulations: Makganyane Mining Right Application, April 2024.

Scientific Aquatic Services (SAS), 2025. Freshwater Ecosystem Assessment. Report number SAS 25-0028, May 2025.

Zimpande Research Collaborative (ZRC), 2025. Soil, Land-use and Land Capability Assessment Report. Report number ZRC 25-4008, May 2025.

Kind regards,

Leon Bredenhann

Director

EAPASA Reg. No. 2020/1726
IWMSA Senior Fellow: Reg. No. 11489039
EAPAN Reg. No. 185

Appendix A – Analytical Certificates

WATERLAB (PTY) LTD
Reg. No.: 1983/009165/07 V.A.T. No.: 4130107891
23B De Havilland Crescent
Persequor Techno Park,
Meiring Naudé Road, Pretoria
P.O. Box 283, 0020
Telephone: +2712 – 349 – 1066
Facsimile: +2712 – 349 – 2064
Email: accounts@waterlab.co.za

CERTIFICATE OF ANALYSES
ACID – BASE ACCOUNTING
EPA-600 MODIFIED SOBEK METHOD

Date received:	**2025-05-02**		**Date completed:**	**2025-06-02**
Project number:	**1000**	**Report number: 143267**	**Order number:**	

Client name:	**IQS Holdings**	**Contact person:**	**Zelda van Wyk**
Address:	**64 Halepensis Street, Lynnwood Ridge, 0081**	**Email:**	**zelda@igsholdings.com**
Telephone:	**---**	**Cell:**	**082 253 0669**

Acid – Base Accounting	Sample Identification				
Modified Sobek (EPA-600)	MK0049	MK0079	MK0239	MK0240	MK0240
Sample Number	25-5843	25-5844	25-5845	25-5846	25-5846 D
Paste pH	7.4	7.0	7.0	7.0	7.0
Total Sulphur (%) [o]	0.059	0.072	0.124	0.128	0.128
Acid Potential (AP) (kg/t)	1.84	2.25	3.88	4.00	4.00
Neutralization Potential (NP)	3.07	1.98	3.72	2.97	3.22
Nett Neutralization Potential (NNP)	1.23	-0.268	-0.160	-1.03	-0.780
Neutralising Potential Ratio (NPR) (NP : AP)	1.67	0.881	0.959	0.743	0.805
Rock Type	III	II	II	II	II

[o] = Outsourced

*** Negative NP values are obtained when the volume of NaOH (0.1N) titrated (pH: 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 – 2.5 Any negative NP values are corrected to 0.00.**

S. Laubscher
Technical Signatory

APPENDIX: TERMINOLOGY AND ROCK CLASSIFICATION

TERMINOLOGY (SYNONYMS)

➢ Acid Potential (AP) ; *Synonyms* : Maximum Potential Acidity (MPA)	**Method**: Total S(%) (Leco Analyzer) x 31.25
➢ Neutralization Potential (NP) ; *Synonyms:* Gross Neutralization Potential (GNP) ; *Syn* : Acid Neutralization Capacity (ANC) (The capacity of a sample to consume acid)	**Method**: Fizz Test ; Acid-Base Titration (Sobek & Modified Sobek (Lawrence) Methods)
➢ Nett Neutralization Potential (NNP) ; *Synonyms:* Nett Acid Production Potential (NAPP)	**Calculation:** NNP = NP – AP ; NAPP = ANC – MPA
➢ Neutralising Potential Ratio (NPR)	**Calculation:** NPR = NP : AP

CLASSIFICATION ACCORDING TO NETT NEUTRALISING POTENTIAL (NNP)

If NNP (NP – AP) < 0, the sample has the potential to generate acid
If NNP (NP – AP) > 0, the sample has the potential to neutralise acid produced
Any sample with NNP < 20 is potentiall acid-generating, and any sample with NNP > -20 might not generate acid (Usher *et al* ., 2003)

ROCK CLASSIFICATION

TYPE I	Potentially Acid Forming	Total S(%) > 0.25% and NP:AP ratio 1:1 or less
TYPE II	Intermediate	Total S(%) > 0.25% and NP:AP ratio 1:3 or less
TYPE III	Non-Acid Forming	Total S(%) < 0.25% and NP:AP ratio 1:3 or greater

CLASSIFICATION ACCORDING TO NEUTRALISING POTENTIAL RATIO (NPR)

Guidelines for screening criteria based on ABA (Price *et al* ., 1997 ; Usher *et al* ., 2003)

Potential for ARD	Initial NPR Screening Criteria	Comments
Likely	**< 1:1**	Likely AMD generating
Possibly	**1:1 – 2:1**	Possibly AMD generating if NP is insufficiently reactive or is depleted at a faster rate than sulphides
Low	**2:1 – 4:1**	Not potentially AMD generating unless significant preferential exposure of sulphides along fracture planes, or extremely reactive sulphides in combination with insufficiently reactive NP
None	**>4:1**	No further AMD testing required unless materials are to be used as a source of alkalinity

CLASSIFICATION ACCORDING TO SULPHUR CONTENT (%S) AND NEUTRALISING POTENTIAL RATIO (NPR)

For sustainable long-term acid generation, at least 0.3% Sulphide-S is needed. Values below this can yield acidity but it is likely to be only of short-term significance. From these facts, and using the NPR values, a number of rules can be derived:

1) Samples with less than 0.3% Sulphide-S are regarded as having insufficient oxidisable Sulphide-S to sustain acid generation.
2) NPR ratios of >4:1 are considered to have enough neutralising capacity.
3) NPR ratios of 3:1 to 1:1 are consider inconclusive.
4) NPR ratios below 1:1 with Sulphide-S above 3% are potentially acid-generating. (Soregaroli & Lawrence, 1998 ; Usher *et al* ., 2003)

REFERENCES

LAWRENCE, R.W. & WANG, Y. 1997. **Determination of Neutralization Potential in the Prediction of Acid Rock Drainage**. Proc. 4th International Conference on Acid Rock Drainage. Vancouver. BC. pp. 449 – 464.

PRICE, W.A., MORIN, K. & HUTT, N. 1997. **Guidelines for the prediction of Acid Rock Drainage and Metal leaching for mines in British Columbia** : Part 11. Recommended procedures for static and kinetic testing. In: Proceedings of the Fourth International Conference on Acid Rock Drainage. Vol 1. May 31 – June 6. Vancouver, BC., pp. 15 – 30.

SOBEK, A.A., SCHULLER, W.A., FREEMAN, J.R. & SMITH, R.M. 1978. **Field and laboratory methods applicable to overburdens and minesoils**. EPA-600/2-78-054. USEPA. Cincinnati. Ohio.

SOREGAROLI, B.A. & LAWRENCE, R.W. 1998. Update on waste Characterisation Studies. Proc. Mine Design, Operations and Closure Conference. Polson, Montana.

USHER, B.H., CRUYWAGEN, L-M., DE NECKER, E. & HODGSON, F.D.I. 2003. **Acid-Base : Accounting, Techniques and Evaluation (ABATE): Recommended Methods for Conducting and Interpreting Analytical Geochemical Assessments at Opencast Collieries in South Africa.** Water Research Commission Report No 1055/2/03. Pretoria.

ENVIRONMENT AUSTRALIA. 1997. **Managing Sulphidic Mine Wastes and Acid Drainage**.

WATERLAB (PTY) LTD

Reg. No.: 1983/009165/07 V.A.T. No.: 4130107891

23B De Havilland Crescent
Persequor Techno Park,
Meiring Naudé Road, Pretoria
P.O. Box 283, 0020

Telephone: +2712 – 349 – 1066
Facsimile: +2712 – 349 – 2064
Email: accounts@waterlab.co.za

CERTIFICATE OF ANALYSES
LEACHATE

Date received:	**2025-05-02**	**Date completed:**	**2025-06-02**
Project number:	**1000**	**Report number:** **143267**	**Order number:**

Client name:	**IQS Holdings**	**Contact person:**	**Zelda van Wyk**
Address:	**64 Halepensis Street, Lynnwood Ridge, 0081**	**Email:**	**zelda@igsholdings.com**
Telephone:	**---**	**Cell:**	**082 253 0669**

Analyses	**Method Identification**	**Sample Identification**							
		MK0049		**MK0079**		**MK0239**		**MK0240**	
Sample Number		**25-5843**		**25-5844**		**25-5845**		**25-5846**	
Leachate used	WLAB075	**Distilled Water**		**Distilled Water**		**Distilled Water**		**Distilled Water**	
Mass Used (g)	---	**20**		**20**		**20**		**20**	
Volume Used (mℓ)	---	**400**		**400**		**400**		**400**	
pH Value at 25˚C	WLAB001	7.4		6.9		7.2		7.0	
Inorganic Anions		**mg/ℓ**	**mg/kg**	**mg/ℓ**	**mg/kg**	**mg/ℓ**	**mg/kg**	**mg/ℓ**	**mg/kg**
Chloride as Cl	WLAB046	2	40	2	40	2	40	7	140
Sulphate as SO_4	WLAB046	<2	<40	<2	<40	3	60	4	80
Nitrate as N	WLAB046	<0.1	<2.0	<0.1	<2.0	<0.1	<2.0	<0.1	<2.0
Fluoride as F	WLAB014	<0.2	<4.0	<0.2	<4.0	<0.2	<4.0	<0.2	<4.0
Free & Saline Ammonia as N	WLAB046	<0.1	<2.0	<0.1	<2.0	<0.1	<2.0	<0.1	<2.0
Ammonium as N (calc)	WLAB068	<0.3	<6.0	<0.3	<6.0	<0.3	<6.0	<0.3	<6.0
Hexavalent Chromium as Cr^{6+}	WLAB046	<0.010	<0.200	<0.010	<0.200	<0.010	<0.200	<0.010	<0.200
ICP-MS Full Quant	---	See ICP DW tab							

S. Laubscher
Technical Signatory

WATERLAB (PTY) LTD

CERTIFICATE OF ANALYSES

ICP-MS FULL QUANTITATIVE ANALYSIS

Date received:	2025-05-02	**Date completed:**	2025/06/02
Project number:	1000	**Report number:**	143267

Client name:	IQS Holdings	**Contact person:**	Zelda van Wyk
Address:	64 Halepensis Street, Lynnwood Ridge, 0081	**Email:**	zelda@igsholdings.com
Telephone:	---	**Cell:**	082 253 0669

Extract	Sample Mass (g)	Volume (ml)	Factor
Distilled Water	20	400	20

Sample Id	Sample Number	Ag	Ag	Al	Al	As	As
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.100	<2.00	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	0.462	9.24	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	0.955	19	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.100	<2.00	<0.001	<0.020
MK0240	25-5846	0.009	0.189	0.605	12	0.002	0.048

Sample Id	Sample Number	Au	Au	B	B	Ba	Ba
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.025	<0.500	<0.025	<0.500
MK0049	25-5843	<0.001	<0.020	<0.025	<0.500	<0.025	<0.500
MK0079	25-5844	<0.001	<0.020	<0.025	<0.500	0.028	0.559
MK0239	25-5845	<0.001	<0.020	<0.025	<0.500	0.158	3.16
MK0240	25-5846	<0.001	<0.020	<0.025	<0.500	0.398	7.97

Sample Id	Sample Number	Be	Be	Bi	Bi	Ca	Ca
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<0.500	<0.001	<0.020	<1	<20
MK0049	25-5843	<0.025	<0.500	<0.001	<0.020	2	45
MK0079	25-5844	<0.025	<0.500	<0.001	<0.020	2	33
MK0239	25-5845	<0.025	<0.500	<0.001	<0.020	3	51
MK0240	25-5846	<0.025	<0.500	<0.001	<0.020	3	53

Sample Id	Sample Number	Cd	Cd	Ce	Ce	Co	Co
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500

Sample Id	Sample Number	Cr	Cr	Cs	Cs	Cu	Cu
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<0.500	<0.001	<0.020	<0.010	<0.200
MK0049	25-5843	<0.025	<0.500	<0.001	<0.020	<0.010	<0.200
MK0079	25-5844	<0.025	<0.500	<0.001	<0.020	<0.010	<0.200
MK0239	25-5845	<0.025	<0.500	<0.001	<0.020	<0.010	<0.200
MK0240	25-5846	<0.025	<0.500	<0.001	<0.020	<0.010	<0.200

Sample Id	Sample Number	Dy	Dy	Er	Er	Eu	Eu
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	Fe	Fe	Ga	Ga	Gd	Gd
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<0.500	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	1.41	28	0.002	0.035	<0.001	<0.020
MK0079	25-5844	2.42	48	0.004	0.082	<0.001	<0.020
MK0239	25-5845	0.094	1.89	0.023	0.453	<0.001	<0.020
MK0240	25-5846	0.656	13	0.053	1.06	<0.001	<0.020

Sample Id	Sample Number	Ge	Ge	Hf	Hf	Hg	Hg
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	Ho	Ho	In	In	Ir	Ir
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	K	K	La	La	Li	Li
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.5	<10.0	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	0.5	10.3	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	0.7	14.2	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	0.3	5.6	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	1.0	19.4	<0.001	<0.020	0.004	0.082

Sample Id	Sample Number	Lu	Lu	Mg	Mg	Mn	Mn
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<1	<20	<0.025	<0.500
MK0049	25-5843	<0.001	<0.020	1	27	0.123	2.45
MK0079	25-5844	<0.001	<0.020	<1	<20	0.129	2.59
MK0239	25-5845	<0.001	<0.020	1	28	<0.025	<0.500
MK0240	25-5846	<0.001	<0.020	1	21	0.449	8.97

Sample Id	Sample Number	Mo	Mo	Na	Na	Nb	Nb
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<0.500	<1	<20	<0.001	<0.020
MK0049	25-5843	<0.025	<0.500	<1	<20	<0.001	<0.020
MK0079	25-5844	<0.025	<0.500	<1	<20	<0.001	<0.020
MK0239	25-5845	<0.025	<0.500	<1	<20	<0.001	<0.020
MK0240	25-5846	<0.025	<0.500	<1	<20	0.002	0.034

Sample Id	Sample Number	Nd	Nd	Ni	Ni	Os	Os
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.025	<0.500	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.025	<0.500	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.025	<0.500	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.025	<0.500	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.025	<0.500	<0.001	<0.020

Sample Id	Sample Number	P	P	Pb	Pb	Pd	Pd
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	0.002	0.032

Sample Id	Sample Number	Pr	Pr	Pt	Pt	Rb	Rb
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	0.002	0.044

Sample Id	Sample Number	Rh	Rh	Ru	Ru	Sb	Sb
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	Sc	Sc	Se	Se	Si	Si
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.2	<4.0
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	2.5	49
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	3.3	66
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	0.7	13.5
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	1.4	28

Sample Id	Sample Number	Sm	Sm	Sn	Sn	Sr	Sr
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	0.029	0.586
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500

Sample Id	Sample Number	Ta	Ta	Tb	Tb	Te	Te
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	Th	Th	Ti	Ti	Tl	Tl
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	Tm	Tm	U	U	V	V
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.025	<0.500

Sample Id	Sample Number	W	W	Y	Y	Yb	Yb
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0049	25-5843	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0079	25-5844	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0239	25-5845	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
MK0240	25-5846	<0.001	<0.020	<0.001	<0.020	<0.001	<0.020

Sample Id	Sample Number	Zn	Zn	Zr	Zr
		mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<0.500	<0.001	<0.020
MK0049	25-5843	<0.025	<0.500	<0.001	<0.020
MK0079	25-5844	<0.025	<0.500	<0.001	<0.020
MK0239	25-5845	<0.025	<0.500	<0.001	<0.020
MK0240	25-5846	<0.025	<0.500	<0.001	<0.020

WATERLAB (PTY) LTD

Reg. No.: 1983/009165/07 V.A.T. No.: 4130107891

23B De Havilland Crescent
Persequor Techno Park,
Meiring Naudé Road, Pretoria
P.O. Box 283, 0020

Telephone: +2712 – 349 – 1066
Facsimile: +2712 – 349 – 2064
Email: accounts@waterlab.co.za

CERTIFICATE OF ANALYSES

NET ACID GENERATION

Date received:	**2025-05-02**			**Date completed:**	**2025-06-02**
Project number:	**1000**	**Report number:**	**143267**	**Order number:**	

Client name:	**IQS Holdings**	**Contact person:**	**Zelda van Wyk**
Address:	**64 Halepensis Street, Lynnwood Ridge, 0081**	**Email:**	**zelda@igsholdings.com**
Telephone:	**---**	**Cell:**	**082 253 0669**

Net Acid Generation	Sample Identification: pH 4.5				
	MK0049	MK0079	MK0239	MK0240	MK0240
Sample Number	**25-5843**	**25-5844**	**25-5845**	**25-5846**	**25-5846 D**
NAG pH: (H_2O_2)	6.5	6.4	6.4	6.3	6.3
NAG (kg H_2SO_4 / t)	<0.01	<0.01	<0.01	<0.01	<0.01

Net Acid Generation	Sample Identification: pH 7.0				
	MK0049	MK0079	MK0239	MK0240	MK0240
Sample Number	**25-5843**	**25-5844**	**25-5845**	**25-5846**	**25-5846 D**
NAG pH: (H_2O_2)	6.5	6.4	6.4	6.3	6.3
NAG (kg H_2SO_4 / t)	1.18	1.57	1.37	1.57	1.76

Notes:

- Samples analysed with Single Addition NAG test as per Prediction Manual For Drainage Chemistry from Sulphidic Geological Materials MEND Report 1.20.1.
- Please let me know if results do not correspond to other data.

S. Laubscher
Technical Signatory

WATERLAB (PTY) LTD

Reg. No.: 1983/009165/07 V.A.T. No.: 4130107891

23B De Havilland Crescent
Persequor Techno Park,
Meiring Naudé Road, Pretoria
P.O. Box 283, 0020

Telephone: +2712 – 349 – 1066
Facsimile: +2712 – 349 – 2064
Email: accounts@waterlab.co.za

CERTIFICATE OF ANALYSES

SULPHUR SPECIATION [o]

Date received: 2025-05-02
Date completed:

Project number: 1000
Report number: 143267
Order number:

Client name: IQS Holdings
Contact person:

Address: 64 Halepensis Street, Lynnwood Ridge, 0081
Email:

Telephone: ---
Cell:

Analyses	Sample Identification			
	MK0049	MK0079	MK0239	MK0240
Sample Number	**25-5843**	**25-5844**	**25-5845**	**25-5846**
Total Sulphur (%) [o]	0.059	0.072	0.124	0.128
Sulphate Sulphur as S (%) [o]	0.059	0.067	0.120	0.128
Sulphide Sulphur (%) [o]	<0.010	<0.010	<0.010	<0.010

[o] = Outsourced

S. Laubscher
Technical Signatory

2025-06-02

Zelda van Wyk
zelda@igsholdings.com
082 253 0669

ort, parts of this report may not

WATERLAB (PTY) LTD

Reg. No.: 1983/009165/07 V.A.T. No.: 4130107891

23B De Havilland Crescent
Persequor Techno Park,
Meiring Naudé Road, Pretoria
P.O. Box 283, 0020

Telephone: +2712 – 349 – 1066
Facsimile: +2712 – 349 – 2064
Email: accounts@waterlab.co.za

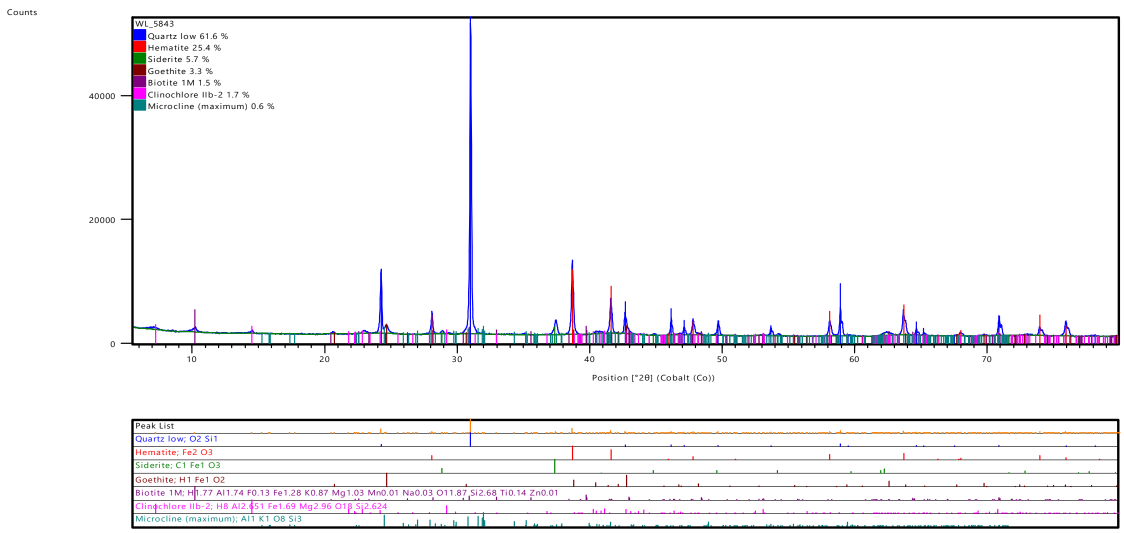
CERTIFICATE OF ANALYSES
X-RAY DIFFRACTION [o]

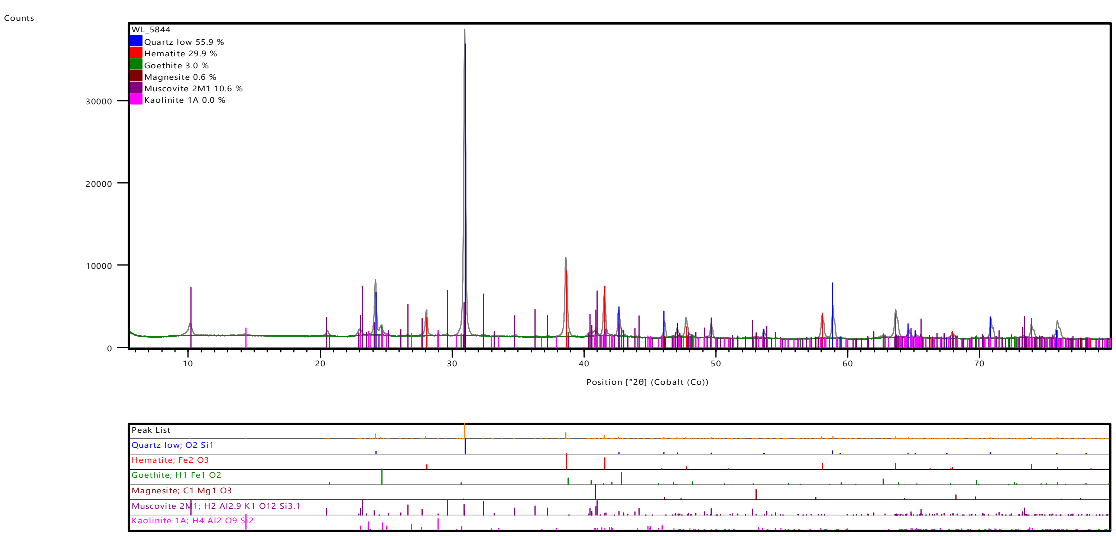
Date received:	**2025-05-02**		**Date completed:**	**2025-06-02**
Project number:	**1000**	**Report number: 143267**	**Order number:**	

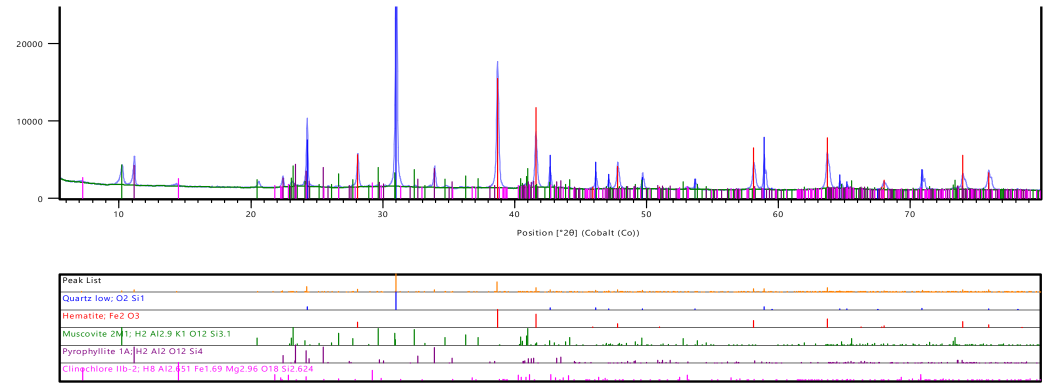
Client name:	**IQS Holdings**	**Contact person:**	**Zelda van Wyk**
Address:	**64 Halepensis Street, Lynnwood Ridge, 0081**	**Email:**	**zelda@igsholdings.com**
Telephone:	**---**	**Cell:**	**082 253 0669**

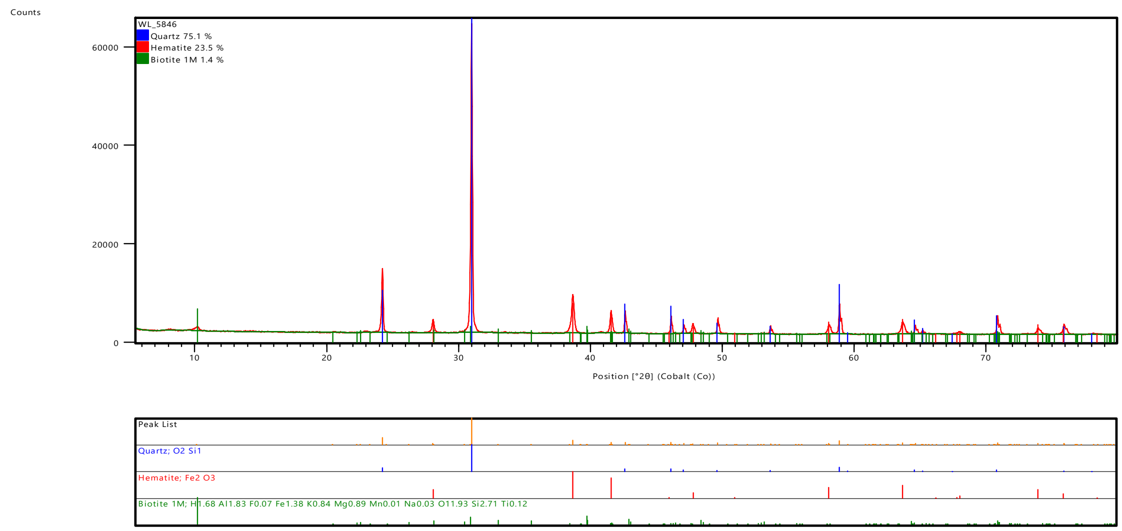
Analyses	Sample Identification:			
	MK0049	MK0079	MK0239	MK0240
Sample Number	25-5843	25-5844	25-5845	25-5846
Mineral Amount (weight %)	Composition (%) [o]			
Quartz	61.65	55.95	47.69	75.09
Hematite	25.41	29.91	35.56	23.51
Goethite	3.33	3	0	0
Microcline	0.64	0	0	0
Siderite	5.74	0	0	0
Magnesite	0	0.57	0	0
Muscovite	0	10.58	8.65	0
Biotite	1.49	0	0	1.4
Pyrophyllite	0	0	6.75	0
Chlorite	1.74	0	1.35	0
Kaolinite	0	trace	0	0

[o] = Outsourced









Note:

The material was prepared for XRD analysis using a back loading preparation method.
Diffractograms were obtained using a Malvern Panalytical Aeris diffractometer with PIXcel detector and fixed slits with Fe filtered Co-Kα radiation.
The phases were identified using X'Pert Highscore plus software.

The relative phase amounts (weight %) were estimated using the Rietveld method.

Comment:

- In case the results do not correspond to results of other analytical techniques, please let me know for further fine tuning of XRD results.
- Mineral names may not reflect the actual compositions of minerals identified, but rather the mineral group.
- Smectite, lizardite (serpentine), vermiculite, chlorite and kaolinite peaks overlap and further test would be necessary to distinguish. Identification is largely based on peak shapes and positions.
- Due to preferred orientation and crystallite size effects, results may not be as accurate as shown.
- Traces of additional phases may be present. Amounts below 0.5 weight % may be unreliable.
- Amorphous phases, if present, were not taken into consideration during quantification.

Ideal Mineral compositions:

Compound Name	Chemical Formula
Biotite	K(Mg,Fe)3 ((OH)2 Al Si3 O10)
Chlorite	(Mg,Fe)5Al(AlSi3O10)(OH)8
Goethite	Fe2O3.H2O
Hematite	Fe2O3
Kaolinite	Al2Si2O5(OH)4
Magnesite	Mg(CO3)
Microcline	KAlSi3O8
Muscovite	KAl3Si3O10(OH)2
Pyrophyllite	Al(Si2O5)(OH)
Quartz	SiO2
Siderite	FeCO3

S. Laubscher
Technical Signatory

WATERLAB (PTY) LTD

Reg. No.: 1983/009165/07 V.A.T. No.: 4130107891

23B De Havilland Crescent
Persequor Techno Park,
Meiring Naudé Road, Pretoria
P.O. Box 283, 0020

Telephone: +2712 – 349 – 1066
Facsimile: +2712 – 349 – 2064
Email: accounts@waterlab.co.za

CERTIFICATE OF ANALYSES

X-RAY FLUORESENCE [o]

Date received:	**2025-05-02**	**Date completed:**	**2025-06-02**
Project number:	**1000**	**Report number:** **143267**	**Order number:**

Client name:	**IQS Holdings**	**Contact person:**	**Zelda van Wyk**
Address:	**64 Halepensis Street, Lynnwood Ridge, 0081**	**Email:**	**zelda@igsholdings.com**
Telephone:	**---**	**Cell:**	**082 253 0669**

Analyses		Sample Identification:			
		MK0049	MK0079	MK0239	MK0240
Sample Number		25-5843	25-5844	25-5845	25-5846
Major Elements		Major Element Concentration (wt %)[o]			
Silica	SiO_2-	52.41	52.98	52.85	66.45
Titanium	TiO_2	0.56	0.41	0.54	0.26
Aluminium	Al_2O_3	4.51	6.49	7.47	3.42
Iron	Fe_2O_3	35.41	34.94	34.56	22.39
Manganese	MnO	0.39	0.51	0.25	5.02
Magnesium	MgO	0.96	0.33	0.45	0.18
Calcium	CaO	0.38	0.13	0.17	0.11
Sodium	Na_2O	<0.01	<0.01	<0.01	<0.01
Potassium	K_2O	0.91	1.45	1.16	0.73
Phosphorous	P_2O_5	0.19	0.15	0.17	0.11
Chromium	Cr_2O_3	0.06	0.07	0.07	0.04
Sulphur	SO_3	0.64	0.65	0.78	0.72
Loss on Ignition (1000 ^oC)	LOI	5.06	3.1	2.4	1.38
Total	Total	100.35	100.34	99.93	99.56
Loss of Moisture (105 ^oC)	H_2O-	0.32	0.61	0.23	0.13

[o] = Outsourced

Notes: % g/g is equivalent to wt %; mg/kg is equivalent to ppm; n.d. = not determined; bold italicised font represents semi-quantitative data; * represents measurements reported in % g/g or wt%.

Analyses		Sample Identification:			
		MK0049	MK0079	MK0239	MK0240
Sample Number		25-5843	25-5844	25-5845	25-5846
Trace Element		Trace Element Concentration (ppm) [o]			
Arsenic	As	<0.43	<0.43	<0.43	<0.43
Barium	Ba	91.4	161	1482	1491
Bismuth	Bi	<0.68	<0.68	<0.68	0.8
Cadmium	Cd	<3.04	<3.04	<3.04	<3.04
Cerium	Ce	9.56	41.1	35.4	30.9
Chlorine	Cl	<2.59	<2.59	<2.59	<2.59
Cobalt	Co	77	139	151	<0.56
Caesium	Cs	1.33	1.09	1.38	0.88
Copper	Cu	<4.19	<4.19	<4.19	<4.19
Galium	Ga	19.1	19.8	20.3	4.95
Germanium	Ge	<0.50	<0.50	<0.50	<0.50
Hafnium	Hf	11.3	11.1	11.2	5.91
Mercury	Hg	<1.00	<1.00	<1.00	<1.00
Lanthanum	La	<0.62	<0.62	<0.62	<0.62
Lutetium	Lu	<0.61	<0.61	<0.61	<0.61
Molybdenum	Mo	<0.51	<0.51	<0.51	1.49
Niobium	Nb	15.8	8.99	11	4.56
Neodymium	Nd	24.4	30	29	33.3
Nickel	Ni	102	99.9	109	89.6
Lead	Pb	353	344	388	216
Rubidium	Rb	122	118	124	48.2
Antimony	Sb	<1.48	<1.48	<1.48	2.8
Scandium	Sc	16.3	15.5	16	13
Selenium	Se	3.23	2.47	3.15	0.45
Samarium	Sm	<1.62	<1.62	<1.62	<1.62
Tin	Sn	1.01	<0.08	5.63	<0.08
Strontium	Sr	28.3	55.4	84.9	74.9
Tantalum	Ta	2.07	2.42	1.86	1.73
Tellurium	Te	<0.16	<0.16	<0.16	<0.16
Thorium	Th	12.9	13.1	13	14.5
Thallium	Tl	0.57	<0.11	1.04	<0.11
Uranium	U	<0.74	<0.74	<0.74	<0.74
Vanadium	V	25.2	37	34.3	<7.6
Tungsten	W	<0.29	<0.29	<0.29	1.93
Yttrium	Y	<0.97	<0.97	<0.97	<0.97
Ytterbium	Yb	<1.05	<1.05	<1.05	15
Zinc	Zn	111	100	106	69.1
Zirconium	Zr	134	93.2	136	55.7

[o] = Outsourced

XRF: Major Element Analysis (Geological)

The samples were prepared by first drying the samples at 100$_o$C for ~3 hours in order to determine loss of moisture content (H_2O-), followed by ashing of the sample at 1000$_o$C until completely ashed, to determine the loss on ignition (LOI). XRF analyses were performed using a PANalytical Epsilon 3 XL ED-XRF spectrometer, equipped with a 50kV Ag-anode X-ray tube, 6 filters, a helium purge facility and a high resolution silicon drift detector, calibrated using a number of international and national certified reference materials (CRMs).

XRF: Trace Element Analysis (Geological)

XRF analyses were performed using a PANalytical Epsilon 3 XL ED-XRF spectrometer, equipped with a 50kV Ag-anode X-ray tube, 6 filters, a helium purge facility and a high resolution silicon drift detector, calibrated using international and national certified reference materials (CRMs).

S. Laubscher

Technical Signatory

Appendix B – EIA Methodology

Methodology for the assessment of the potential environmental, social and cultural impacts

DEFINITIONS AND CONCEPTS

Environmental Significance

The concept of significance is at the core of impact identification, evaluation and decision-making. The concept remains largely undefined and there is no international consensus on a single definition. The following common elements are recognized from the various interpretations:

- δ Environmental significance is a value judgment
- δ The degree of environmental significance depends on the nature of the impact
- δ The importance is rated in terms of both biophysical and socio-economic values
- δ Determining significance involves the amount of change to the environment perceived to be acceptable to affected communities.

Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of acceptability) (DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5).

The concept of risk has two dimensions, namely the consequence of an event or set of circumstances, and the likelihood of particular consequences being realised (Environment Australia (1999) Environmental Risk Management).

Impact

The positive or negative effects on human well-being and / or the environment.

Consequence

The intermediate or final outcome of an event or situation OR it is the result, on the environment, of an event.

Likelihood

A qualitative term covering both probability and frequency.

Frequency

The number of occurrences of a defined event in a given time or rate.

Probability

The likelihood of a specific outcome measured by the ratio of a specific outcome to the total number of possible outcomes.

Environment

Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation (ISO 14004, 1996).

Methodology that will be used

The environmental significance assessment methodology is based on the following determination:

Environmental Significance = Overall Consequence x Overall Likelihood

Determination of Overall Consequence

Consequence analysis is a mixture of quantitative and qualitative information, and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: Severity/Intensity, Duration and Extent/Spatial Scale. Each factor is assigned a rating of 1 to 5, as described in the tables below.

Determination of Severity / Intensity

Severity relates to the nature of the event, aspect or impact to the environment and describes how severe the aspects impact on the biophysical and socio-economic environment.

Table 1: Table to be used to obtain an overall rating of severity, taking into consideration the various criteria.

TYPE OF CRITERIA	**RATING**				
	1	**2**	**3**	**4**	**5**
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant/ Harmful	Great/ Very harmful	Disastrous Extremely harmful

TYPE OF CRITERIA	RATING				
	1	2	3	4	5
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance/ Easily reversible	Low cost to mitigate	Substantial cost to mitigate/ Potential to mitigate impacts/ Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate/ Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Determination of Duration

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Table 2: Criteria for the rating of duration.

RATING	DESCRIPTION
1	Up to ONE MONTH
2	ONE MONTH to THREE MONTHS (QUARTER)
3	THREE MONTHS to ONE YEAR
4	ONE to TEN YEARS
5	Beyond TEN YEARS

Determination of Extent/Spatial Scale

Extent or **spatial scale** is the area affected by the event, aspect or impact.

Table 3: Criteria for the rating of extent / spatial scale.

RATING	DESCRIPTION
1	Immediate, fully contained area
2	Surrounding area
3	Within Business Unit area of responsibility
4	Within the farm/neighbouring farm area
5	Regional, National, International

Determination of Overall Consequence

Overall consequence is determined by adding the factors determined above and summarized below, and then dividing the sum by 3.

Table 4: Example of calculating overall consequence.

CONSEQUENCE	RATING
Severity	Example 4
Duration	Example 2
Extent	Example 4
SUBTOTAL	**10**
TOTAL CONSEQUENCE: (Subtotal divided by 3)	**3.3**

Determination of Likelihood

The determination of likelihood is a combination of Frequency and Probability. Each factor is assigned a rating of 1 to 5, as described below.

Determination of Frequency

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

Table 5: Criteria for the rating of frequency.

RATING	DESCRIPTION
1	Once a year or once/more during operation
2	Once/more in 6 Months
3	Once/more a Month
4	Once/more a Week
5	Daily

Determination of Probability

Probability refers to how often the activity or aspect has an impact on the environment.

Table 6: Criteria for the rating of probability.

RATING	DESCRIPTION
1	Almost never / almost impossible
2	Very seldom / highly unlikely
3	Infrequent / unlikely / seldom
4	Often / regularly / likely / possible
5	Daily / highly likely / definitely

Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarized below, and then dividing the sum by 2.

Table 7: Example of calculating overall likelihood.

CONSEQUENCE	RATING
Frequency	Example 4
Probability	Example 2
SUBTOTAL	**6**
TOTAL LIKELIHOOD (Subtotal divided by 2)	**3**

Determination of Overall Environmental Significance

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of **LOW, LOW-MEDIUM, MEDIUM, MEDIUM-HIGH** or **HIGH**, as shown in the table below.

Table 8: Determination of overall environmental significance.

SIGNIFICANCE OR RISK	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
Overall Consequence X Overall Likelihood	1 - 4.9	5 - 9.9	10 - 14.9	15 – 19.9	20 - 25

Qualitative description or magnitude of Environmental Significance

This description is qualitative and is an indication of the nature or magnitude of the Environmental Significance. It also guides the prioritizations and decision making process associated with this event, aspect or impact.

Table 9: Description of environmental significance and related action required.

SIGNIFICANCE	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
Impact Magnitude	Impact is of very low order and therefore likely to have very little real effect. Acceptable.	Impact is of low order and therefore likely to have little real effect. Acceptable.	Impact is real, and potentially substantial in relation to other impacts. Can pose a risk to company	Impact is real and substantial in relation to other impacts. Pose a risk to the company. Unacceptable	Impact is of the highest order possible. Unacceptable. Fatal flaw.
Action Required	Maintain current management measures.	Maintain current management measures.	Implement monitoring. Investigate mitigation measures and	Improve management measures to reduce risk.	Implement significant mitigation measures or

SIGNIFICANCE	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
	Where possible improve.	Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	improve management measures to reduce risk, where possible.		implement alternatives.

Based on the above, the significance rating scale has been determined as follows:

HIGH Of the highest order possible within the bounds of impacts which could occur. In the case of negative impacts, there would be no possible mitigation and / or remedial activity to offset the impact at the spatial or time scale for which it was predicted. In the case of positive impacts, there is no real alternative to achieving the benefit.

MEDIUM-HIGH Impacts of a substantial order. In the case of negative impacts, mitigation and / or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these. In the case of positive impacts, other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these.

MEDIUM Impact would be real but not substantial within the bounds of those, which could occur. In the case of negative impacts, mitigation and / or remedial activity would be both feasible and fairly easily possible, In case of positive impacts; other means of achieving these benefits would be about equal in time, cost and effort.

LOW-MEDIUM Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and / or remedial activity would be either easily achieved of little would be required, or both. In case of positive impacts alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time-consuming, or some combination of these.

LOW Impact would be negligible. In the case of negative impacts, almost no mitigation and or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap, and simple. In the case of positive impacts, alternative means would almost all likely be better, in one or a number of ways, than this means of achieving the benefit.

INSIGNIFICANT There would be a no impact at all – not even a very low impact on the system or any of its parts.

HOLDINGS

INTEGRITY QUALITY SERVICE

RELENTLESSLY PURSUING REAL SOLUTIONS