



PROPOSED MINING ACTIVITIES FOR THE HAIB MINE

HYDROGEOLOGICAL PFS SPECIALIST ASSESSMENT

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EXECUTIVE SUMMARY

Introduction

The Haib Copper Project (the Project) is being developed by Haib Minerals (Pty) Ltd (Haib Minerals), a subsidiary of Koryx Copper S. A. (Koryx). The Project is a porphyry copper exploration project located in the //Karas Region of southern Namibia. The target resources for mining activities include copper and molybdenum. Haib Minerals (Pty) Ltd. holds Exclusive Prospecting License (EPL) 3140, which allows for the exploration of base, rare and precious metals over an area of 36,571 hectares (ha).

Koryx has a 100% interest in Haib Minerals (Pty) Ltd (formerly Deep South Mining Company (Pty) Ltd.), a Namibian subsidiary which holds the exploration rights to the Haib Project on EPL3140.

Haib Minerals seeks to apply for an Environmental Clearance Certificate (ECC) for the development of mining activities on EPL3140. The Project triggers listed activities under the Environmental Management Act (EMA), 2007, and requires an ECC from the Ministry of Environment, Forestry and Tourism (MEFT).

This hydrogeological report provides a description of pre-development groundwater conditions for the Haib Copper Project (EPL 3140) in southern Namibia, and an assessment of the expected impacts on the groundwater resource and various downgradient receptors. The report is intended to support environmental and water-management planning. Note that this assessment is completed to pre-feasibility level, and further work will be required to develop the project to feasibility, or bankable feasibility level.

Conceptual groundwater model

Three aquifers are identified in the project area:

- A shallow aquifer associated with the alluvial deposits and river channels. These aquifers are recharged mainly by runoff during rainfall events.
- The upper portion (surface to 40 m depth) of the fractured rock aquifer, where the lithologies are intensely fractured. Groundwater flow in this aquifer is considered to be regional due to the interrelatedness of the fractures. This aquifer is recharged by rainfall and surface runoff.
- A deeper fractured rock aquifer system representative of the volcanic rock and granitic rocks present in the project area. Here groundwater flows are along individual fractures. Recharge is from the overlying intensely fractured aquifer.

The faults, veins and shears in the project area that could control groundwater flow patterns in the upper and deeper fractured rock aquifers predominantly trend east-west and dip south, while a minor amount are trending north-south and dipping east. The structural geology is dominated by an East-West fault, and a North-South Quartz vein, while towards the North is the Northern shear zone.

It is suspected that the aquifer system in the Western portion of the project area is slightly shallower than the Eastern portion, due to the presence of sedimentary rocks of the Karoo sediments in the Western portions.

Groundwater levels in boreholes installed in the alluvial aquifer are generally shallow, typically between 0 and 5 mbgl, reflecting the hydraulic connection with riverbeds and associated floodplain deposits. In contrast, groundwater levels in boreholes intersecting the upper and deeper fractured rock aquifers commonly range between approximately 12 and 40 mbgl, consistent with the greater depth and lower storativity of these units.

The regional groundwater flow is inferred to broadly follow the surface topography and drainage network, with a predominant component directed southwards towards the Orange River, and ultimately westwards along the Orange River valley to the Atlantic Ocean. At the local scale, groundwater flow paths are expected to be strongly controlled by structural features (faults, fractures, shear zones and intrusive contacts), which may channel flow along preferred directions and locally modify the regional gradient.

The heap leach pad, TSF and water ponds for the mine processing are located in the western portions of the project area. Leachate from any of the facilities could potentially increase the local water table creating a mounding effect beneath these facilities. The WRD will behave similarly to these facilities in that a groundwater flux will occur during rainfall periods, precipitation will slowly infiltrate through WRD and seep into the ground. This will result in a local rise in water level around the WRD.

Impact assessment

Impacts on groundwater quantities

Open Pit Dewatering during the Construction Phase

Preparation of the pit during construction will take place in higher-lying areas where measured groundwater levels lie 20–40 m below ground. Numerical modelling indicates that any interception of groundwater in this period will be limited and will not materially reduce the available groundwater volume; the significance of quantity impacts associated with early pit development is therefore low, though baseline level monitoring is recommended.

Open Pit Dewatering during the Operational Phase

The dominant impact on groundwater quantities during operations arises from dewatering of the open pit. As mining progresses and intercepts the groundwater table, dewatering will be required for the 24-year active mining period to maintain safe working conditions.

Numerical modelling shows that the resulting drawdown cone is constrained by topography, with a lateral extent of less than 1.5 km. The maximum drawdown at the pit is estimated to be on the order of 280 m. This drawdown will not reach the final pit bottom elevation, but it will substantially lower the piezometric surface in the active aquifer zone. Deeper depressurisation in the rock mass is possible if fractures remain hydraulically active to depth, though this is uncertain in the absence of detailed packer testing.

Within the drawdown area, groundwater flow will be redirected towards the pit, capturing inflows from the surrounding fractured rock aquifer and, to a limited extent, associated alluvial systems in tributaries of the Volstruis River. Due to the limited role of baseflow in these ephemeral systems even prior to mining, and the relatively small footprint of the drawdown cone in relation to the Volstruis and Haib River catchments, the impact on groundwater resources is assessed as MODERATE in significance at the very local scale (within approximately 250 m of the pit) but LOW when considered regionally.

There are no known private groundwater supply boreholes within the drawdown cone, and operational water demands are planned to be met from the Orange River via NamWater, reducing the risk of competing uses on local groundwater.

Open Pit Dewatering during the Post-Closure Phase

Dewatering of the pit stops at the end of active mining (year 24), allowing groundwater levels in and around the pit to begin recovering while processing continues for another 10 years. The decommissioning period itself (two to three years) is too short for major groundwater rebound, and flow

directions during this time remain largely directed towards the pit, limiting any outward migration of contaminants from the pit area.

Over the longer term, up to 100 years post-closure, the pit is expected to fill partially, but modelling indicates that the pit water level will remain below regional groundwater levels because of low rainfall, limited inflows and high evaporation. Consequently, the pit is expected to continue to function as a hydraulic sink rather than a source, preventing decant and limiting the potential for contaminated pit water to discharge into surrounding aquifers.

From a groundwater quantity perspective, post-closure impacts associated with the pit are LOW.

Surface Infrastructure during the Construction Phase

During the construction phase, impacts on groundwater quantities are expected to be minor. Construction of the TSF, WRD, low-grade stockpile, HLP and associated infrastructure will involve shallow excavations that are not expected to intersect the regional groundwater table, apart from isolated localities where shallow alluvial groundwater may occur. Beneath the lined footprint of the HLP there will be a small, localised reduction in rainfall recharge, and thus a minor lowering of groundwater levels, but this will be negligible in view of the naturally low rainfall, relatively modest footprint, and short construction duration. The WRD and low-grade stockpile will be located in riverbeds directly over alluvial gravels, but no substantial excavations into the alluvials are planned during construction, so no significant effect on groundwater levels in these alluvial aquifers is anticipated at this stage.

Surface Infrastructure during the Operational Phase

During the operational phase, defined as 24 years of active mining and a further 10 years of processing, impacts on groundwater quantities become more pronounced around the open pit and, to a lesser extent, beneath unlined water-bearing facilities.

The lined HLP will locally reduce recharge beneath its footprint relative to natural conditions, but in the arid climatic context and given its limited footprint, this reduction is of LOW significance for groundwater quantities.

The unlined TSF, by contrast, will increase infiltration of water to the underlying aquifers through wet deposition of tailings. This will cause groundwater levels to rise locally beneath and immediately around the TSF, with radial groundwater flow away from the facility developing. While this mounding may change local flow directions and velocities, on a catchment scale the effect remains small and is assessed as LOW in significance.

Similarly, the WRD and the low-grade stockpile, both placed in river valleys overlying permeable alluvial sediments, will enhance local recharge. Rainfall will be stored temporarily in these structures and infiltrate into the underlying alluvials and fractured rock. However, because annual rainfall is very low and infiltration through coarse waste and alluvials is rapid, the increase in recharge and any associated delay is limited; the net impact on groundwater volumes is LOW, confined to the immediate vicinity of these structures.

Surface Infrastructure during the Post-Closure Phase

The lined HLP will locally reduce recharge beneath its footprint relative to natural conditions, but in the arid climatic context and given its limited footprint, this reduction is of low significance for groundwater quantities.

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Off-channel Water Storage Dam during the Construction Phase

Construction of the off-channel water storage dam will introduce a local positive effect on groundwater quantities. The dam, located in a drainage valley, will be unlined and will expose both the valley-floor alluvial aquifer and fractured rock in the valley walls and beneath the alluvials to seepage. Once water from the Orange River is pumped into the dam and the water level is raised to its operational elevation, seepage will begin to recharge these underlying aquifers. During construction, this recharge is limited in time but nonetheless adds locally to groundwater storage; on the scale of the catchment this impact is small, but in the immediate vicinity of the dam it is beneficial.

Off-channel Water Storage Dam during the Operational Phase

The off-channel water storage dam will become a significant local source of recharge during operations. Model results indicate seepage rates to the combined alluvial and fractured-rock aquifers could be as high as 1,000 m³/day. Initially, recharge will be rapid as unsaturated storage is filled, after which the rate will be governed by the permeability of the aquifer materials. The zone of influence of this recharge is constrained by surrounding topography, extending roughly 200–250 m from the dam. Within this zone, groundwater levels in both the valley-floor alluvials and the deeper fractured rock will increase, enhancing water availability. On the larger catchment scale, the impact on overall groundwater resources remains LOW, though locally it is a clear positive effect.

Off-channel Water Storage Dam during the Post-Closure Phase

It is assumed that the off-channel water storage dam will be emptied after the operational phase. When this occurs, its beneficial role in artificially increasing groundwater recharge will stop. Over time, the groundwater quantity in the former zone of influence will tend back towards pre-development conditions; the change is essentially the removal of a positive effect rather than the introduction of a new negative one and is therefore of LOW significance.

Impacts on groundwater qualities

Migration away from the Open Pit during the Operational and Post-Closure Phases

The open pit itself will expose rock faces to oxidation, which may result in some deterioration in the quality of water seeping into the excavation. However, during operations all groundwater and surface inflows to the pit will be pumped out as part of the dewatering system and incorporated into the mine water circuit, including storage in the off-channel dam for reuse.

As long as dewatering is maintained and the pit acts as a hydraulic sink, any contamination mobilised in the vicinity of the pit will be captured on site, and off-site groundwater quality impacts from the pit during operations are therefore of moderate significance. Surrounding monitoring boreholes are necessary to confirm this behaviour and to allow for the installation of scavenger wells if contaminants are detected moving beyond the drawdown cone.

As groundwater rebound continues during the post-closure phase the pit will develop a pit lake. With the lake level stabilising below the regional groundwater table, the pit will maintain a net inflow of groundwater and act as a long-term sink for surrounding groundwater, including any residual contaminants in its vicinity. No decant is expected, and no significant contaminant migration away from the pit is anticipated. The recovery of the groundwater level is classified as a moderate impact (beneficial with respect to contaminant containment) due to the fact that the groundwater levels are not expected to fully recover to pre-mining levels combined with the fact that the lower pit water level will contain contamination within the pit.

Surface infrastructure during the Construction Phase

The main risk arises from hydrocarbon and other chemical spills and runoff from construction activities. This is of particular concern in river channels underlain by permeable alluvial aquifers, where shallow groundwater and high hydraulic conductivity could allow more rapid down-gradient migration of contaminants. The storage capacity and sorptive properties of the alluvials will mitigate this to some extent, and the overall significance of such spill-related impacts during construction is considered moderate, provided standard spill prevention and clean-up measures are implemented.

Early material placed on the WRD during construction consists mainly of shallow, oxidised rock classified as potentially acid neutralising. Geochemical assessments indicate that aluminium and iron could leach at concentrations exceeding “excellent” drinking water quality thresholds, but given the low rainfall, small volumes involved and relatively short construction period, leachate fluxes to groundwater will be limited and the associated impact on groundwater quality is correspondingly moderate.

No material is expected to be placed on the TSF or low-grade ore stockpile during construction, and the HLP will not yet be operational; hence no process-related contamination is expected from these facilities in this phase.

Surface infrastructure during the Operational Phase

The operational phase introduces the full range of geochemical and hydrogeological interactions associated with unlined waste disposal facilities, the open pit, and potential spills. Detailed static and kinetic geochemical testing, supported by modelling, indicates that most materials placed on the WRD, low-grade ore stockpile and TSF are either potentially acid neutralising or of uncertain acid-generating potential; persistent, strongly acidic drainage is therefore considered unlikely. However, leachate from these materials is expected to contain elevated concentrations of certain constituents, notably aluminium and, in some cases, molybdenum and lead.

Modelled aluminium concentrations range from less than 0.1 mg/L at the start of operations to roughly 0.22 mg/L from the WRD, up to about 0.29 mg/L from the low-grade stockpile, and 2 mg/L from the TSF. Kinetic tests suggest iron concentrations in leachates will generally remain below 0.05 mg/L, despite higher values in some static tests, and molybdenum in tailings leachate is expected to rise to around 0.07–0.096 mg/L.

It is important to note that natural groundwater in both fractured rock and alluvial aquifers already exhibit aluminium concentrations above Namibian “excellent” guideline levels in many locations, with typical values around 0.187–0.303 mg/L in fractured rock and up to 0.76 mg/L in alluvials. This means that while local concentrations may increase as a result of seepage, exceedance of strict “excellent” standards is already a feature of the baseline condition, and the marginal effect on regulatory compliance is correspondingly limited.

The low-grade ore stockpile will be unlined and located in river valleys west of the pit, underlain by alluvial aquifers at the valley base and upper fractured-rock aquifers along the flanks. Leachate

generated by rainfall on the stockpile will percolate into the alluvials and fractures. Due to the low rainfall, the volume of leachate is limited, and the hydrogeological setting is such that the majority of this seepage is drawn towards the open pit, because the stockpile partially overlies the dewatering cone. In the alluvial aquifer, contaminants migrate down-valley and discharge into the pit; in the fractured rock, seepage follows fracture networks and also tends to be intercepted by the pit. Consequently, there is no significant additional loading of contaminants to the Haib River via this pathway, and the impact of the low-grade stockpile on groundwater quality is assessed as moderate.

The WRD poses a somewhat greater and more complex risk. Like the low-grade stockpile, it is unlined and located in river valleys where both alluvial and fractured-rock aquifers are present, but it extends close to the main Haib River channel. Leachate from the WRD infiltrates both the alluvials and underlying fractures. In the portion of the WRD that overlies the pit drawdown cone, contaminants are drawn towards the pit. In the eastern portion, however, seepage migrates towards the Haib River alluvials.

Modelling indicates that aluminium concentrations in WRD leachate (on the order of 1.4 mg/L) will be mixed with comparatively good-quality groundwater in the Haib alluvials (average aluminium around 0.04 mg/L), and that, due to the low rainfall and relatively large storage in the alluvial sands, resultant concentrations in the alluvials will remain below the “excellent” threshold of 0.15 mg/L. The plume in the alluvials may extend up to 2.5 km downstream before further mixing with water from tributaries (including seepage from the off-channel dam) dilutes it to levels indistinguishable from background.

In the fractured rock aquifer, a plume migrating towards the Haib River is expected to arrive around year 3 of operations and then increase in extent and concentration until the end of mining. However, because background aluminium in the fractured rock aquifer already exceeds guideline levels, the incremental addition from WRD seepage does not constitute a step change in groundwater quality. Overall, the WRD impact on the alluvial aquifer is assessed as moderate in significance, reflecting the persistence and footprint of the plume, while its impact on the fractured-rock aquifer is considered moderate. Appropriate mitigation will include installation of down-gradient monitoring boreholes in both aquifers and, if necessary, implementation of interceptor trenches and scavenger wells to capture and treat contaminated groundwater.

The TSF represents the single most important long-term source of potential groundwater contamination. It will be developed in subdued topography west of the pit, with several ephemeral drainage channels crossing the footprint and discharging to the Haib River approximately 700 m downstream. The TSF will be unlined, and therefore seepage will infiltrate underlying surficial sands, alluvials in the main channel, and the upper fractured-rock aquifer exposed in adjacent slopes. Aluminium concentrations in TSF leachate are expected to be around 2 mg/L.

In the alluvial aquifer within the main drainage channel, contaminants are predicted to migrate relatively quickly, reaching the Haib River within six months to a year of deposition commencing, depending on site-specific alluvial properties and episodic recharge. Model results suggest that aluminium concentrations in the alluvials at the Haib confluence will gradually increase to about 0.45 mg/L by the end of mining (year 24) and 0.55 mg/L by the end of processing (year 34).

Outside the main channel, plume migration through surficial sands north of the channel is expected to reach the Haib River around year 17, whereas migration through fractured rock south of the channel is predicted to reach the river between years 24 and 25. In all cases, further down-gradient movement within the Haib alluvials will be accompanied by dilution through mixing with relatively less impacted groundwater.

The Farm Borehole located close to the western, nominally up-gradient boundary of the TSF may be affected by seepage driven by the high head in the TSF, potentially reaching aluminium concentrations comparable to the source (around 2 mg/L). However, that property is to be acquired by Haib Minerals, and the borehole is not expected to remain in use.

Overall, the significance of TSF-related groundwater quality impacts in the operational phase is rated as moderate, driven largely by the permanence and high likelihood of seepage rather than an extremely large spatial extent. Monitoring boreholes down-gradient of the TSF, including the farm borehole, are required, and scavenger wells and/or interceptor trenches should be implemented if monitoring indicates unacceptable trends.

The HLP is designed as a lined facility, with a double-liner system (or equivalent) and full collection of pregnant leach solutions at the base. Under proper design, construction, operation and maintenance, direct seepage from the heap leach to groundwater is not anticipated, and its impact on groundwater quality is expected to be negligible. Nonetheless, a limited number of down-gradient monitoring boreholes should be installed to verify liner performance over time and provide early warning of any leakage.

Surface infrastructure during the Post-Closure Phase

After closure, seepage from the TSF, WRD and low-grade stockpile will continue but gradually diminish as infiltration fluxes reduce and source concentrations decline.

For the TSF, once tailings deposition ceases, seepage will be governed primarily by rainfall recharge into the tailings surface and any capping or sloping implemented as part of the closure plan. Given the low rainfall and low permeability of compacted tailings, seepage rates will fall considerably compared with the operational period. Nevertheless, modelling suggests that the contaminant plume emanating from the TSF changes little between 50 and 100 years post-closure, indicating that a steady-state condition is approached and that the plume will remain present for many decades. Because of the permanence of the source and the definite likelihood of continued, albeit reduced, seepage, the long-term impact significance of the TSF on groundwater quality is assessed as moderate, despite the relatively localised footprint and limited incremental toxicity. Post-closure monitoring boreholes must be established down-gradient to track plume behaviour, and closure planning should include options for reducing infiltration (such as capping) and, if needed, long-term capture and treatment.

For the low-grade ore stockpile, cessation of placement means no new contaminant load is added and existing materials are progressively leached of mobile constituents. The plume associated with this facility is largely directed towards the pit, which is expected to maintain a lower water level than the surrounding aquifers and therefore continues to serve as a sink. Limited lateral “spill-over” into adjacent sub-catchments could occur if the footprint straddles divides, but this risk can be reduced by ensuring during design and closure that the stockpile footprint is contained within a single sub-catchment draining towards the pit. The long-term significance of impacts on groundwater quality from the low-grade stockpile is therefore considered moderate, although down-gradient monitoring is still required.

The WRD will continue to generate seepage post-closure, but with no additional waste being placed and with small rainfall inputs, concentrations and fluxes will stabilise. Modelling shows that the plume from the WRD changes little between the start of closure and 50–100 years thereafter. Seepage from the western portion remains directed largely towards the pit, while seepage from the eastern portion continues to migrate towards the Haib River alluvials. Ongoing mixing with relatively good-quality alluvial groundwater means that aluminium concentrations in the Haib alluvials are expected to rise from an average of about 0.04 mg/L to around 0.18 mg/L by roughly 20 years post-closure, stabilising at that level through to at least 100 years. This constitutes a modest increase over background and,

given that background concentrations already exceed strict Namibian “excellent” water quality criteria in many locations, does not represent a significant change. Nonetheless, because the seepage is long-lived and the occurrence of a plume is certain, the WRD is assessed as having a moderate post-closure impact on groundwater quality. Long-term down-gradient monitoring and, where necessary, capture or treatment measures should be incorporated into the mine closure plan.

Off-channel water storage dam during the Construction and Operational Phases

Construction of the off-channel water storage dam will introduce a local positive effect on groundwater quantities. The dam, located in a drainage valley, will be unlined and will expose both the valley-floor alluvial aquifer and fractured rock in the valley walls and beneath the alluvials to seepage. Once water from the Orange River is pumped into the dam and the water level is raised to its operational elevation, seepage will begin to recharge these underlying aquifers. During construction, this recharge is limited in time but nonetheless adds locally to groundwater storage; on the scale of the catchment this impact is small, but in the immediate vicinity of the dam it is beneficial.

Throughout the operational phase, seepage from the off-channel water storage dam continues to have a beneficial effect on groundwater quality underneath and immediately down-gradient, but this zone of positive influence is constrained to within roughly 250 m of the dam.

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APPENDICES

Appendix A – GROUNDWATER CHEMICAL ANALYSIS CERTIFICATES (FEBRUARY 2026)
Appendix B – GEOCHEMICAL ANALYSIS CERTIFICATES

ABBREVIATIONS

ABA	Acid-Base-Accounting
ARD	Acid rock drainage
DFO	Fisheries and Oceans Canada
ECC	Environmental Clearance Certificate
EIS	Environmental impact statement
EPCM	Engineering, procurement and construction management
EPL	Exclusive Prospecting License
FP	Feldspar Porphyry
GFM	Great Fitzroy Mines
HGNO	High Grade Non-Oxidised
HGO	High Grade Oxidised
KP	Knight Piésold (Pty) Ltd
LGNO	Low Grade Non-Oxidised
LGO	Low Grade Oxidised
L/s	Litre per second
MAP	Mean annual precipitation
MAET	Mean Annual Evapotranspiration
mbgl	Metres Below Ground Level
MEFT	Ministry of Environment, Forestry and Tourism
Mm ³	Million cubic metres
mm/a	Millimetres per annum
Mt	Million ton
NCJV	Namibian Copper Joint Venture
NMMB	Namaqua-Natal Metamorphic Belt
ORG	Orange River Group
PAG	Potentially Acid Generating
PAN	Potentially Acid Neutralising
Project	Name of the project
PV	Photovoltaic
QA/QC	Quality Assurance / Quality Control
QD	Quartz Diorite
QBP	Quartz Biotite Porphyry
QFP	Quartz Feldspar Porphyry
RIS	Richtersveld Intrusive Suite
RTZ	Rio Tinto Zinc
SWAD	Storm Water Attenuation Dam
TSF	Tailings storage facility
VIS	Violsdrift Intrusive Suite
WRD	Waste Rock Dump

1.0 INTRODUCTION

The Haib Copper Project (the Project) is being developed by Haib Minerals (Pty) Ltd (Haib Minerals), a subsidiary of Koryx Copper S. A. (Koryx). The Project is a porphyry copper exploration project located in the //Karas Region of southern Namibia. The target resources for mining activities include copper and molybdenum. Haib Minerals (Pty) Ltd. holds Exclusive Prospecting License (EPL) 3140, which allows for the exploration of base, rare and precious metals over an area of 36,571 hectares (ha).

Koryx has a 100% interest in Haib Minerals (Pty) Ltd (formerly Deep South Mining Company (Pty) Ltd.), a Namibian subsidiary which holds the exploration rights to the Haib Project on EPL3140.

Haib Minerals seeks to apply for an Environmental Clearance Certificate (ECC) for the development of mining activities on EPL3140. The Project triggers listed activities under the Environmental Management Act (EMA), 2007, and requires an ECC from the Ministry of Environment, Forestry and Tourism (MEFT).

This hydrogeological report provides a description of pre-development groundwater conditions for the Haib Copper Project (EPL 3140) in southern Namibia, and an assessment of the expected impacts on the groundwater resource and various downgradient receptors. The report is intended to support environmental and water-management planning. Note that this assessment is completed to pre-feasibility level, and further work will be required to develop the project to feasibility, or bankable feasibility level.

1.1 Project Background

The Haib copper deposit has been the target of exploration and small-scale mining since the late 1800s and early 1900s. In 1945, the first recorded copper was produced, and from then on, various prospecting companies continued to show an interest in the deposit and furthered prospecting activities throughout the 1900s.

Rio Tinto Zinc (RTZ) conducted the first extensive and systematic investigation of the Haib deposit during the 1970s. RTZ relinquished their prospecting rights in 1975, and more companies showed interest in the Haib deposit in the 1990s. Great Fitzroy Mines NL (GFM) acquired the deposit and continued with exploration activities until the late 1990s. Namibian Copper Joint Venture (NCJV) ran investigations from the mid to late 1990s. In 2003, 100% of the mineral rights were vested in the Namibian Government. In 2004, the EPL 3140, inclusive of the entire Haib deposit and a large surrounding area, was granted to Koryx Copper (formerly Deep South Mining (Pty) Ltd), subsequently renewed in 2007, 2009, 2011, 2013, 2015, 2017, 2019, 2023 and 2025.

Haib Minerals is currently investigating the deposit structure and methodologies to maximise the feasibility of a project. Exploration activities are now focused on grade exploration, and economic feasibility is unlocked through bio-heap leaching methodologies.

2.0 GENERAL SITE DESCRIPTION

2.1 Location

The Haib copper deposit is located in the Kharas region of Namibia, near the Orange River at the border with South Africa. The project area is accessible along the B1 highway, roughly 780 km South of Windhoek, Namibia, or along the N7 from South Africa where it approaches the Vioolsdrif border post (Connelly, et al., 2018). The nearest railway station is at Grunau, which is approximately 120 km north on the B1. Noordoewer is the closest town, which is located on the Orange River banks approximately 25 km west of the Haib deposit.

2.2 Topography and Drainage

The topography is varied (Figure 2-1) and characterised by relatively flat gradients in the west and extensive hills with prominent dolerite sills in the east within the Gomkab Basin. Elevations vary from 200 to 700 metres above mean sea level (mamsl). The topography for most of the pit area and eastern portion of the EPL is rocky with undulating hills that have gentle rises and dips.

Drainage is ephemeral and primarily dendritic, shaped by underlying lithological and structural controls. The Haib River, a non-perennial tributary of the Orange River, forms the primary surface drainage feature. It only flows briefly during significant rainfall events and otherwise remains dry. Surface water retention in the form of pans or perched pools is absent due to high infiltration rates, steep gradients, and the absence of fine-grained surficial sediments. The Rio Tinto Zinc (RTZ) gorge is a geological feature that similarly drains from the central EPL to the Orange River. This topographic arrangement has direct hydrogeological significance, as it promotes rapid runoff generation during rainfall events, limits the development of thick weathered profiles, and concentrates recharge processes within valley bottoms and structurally controlled depressions rather than across the broader landscape.

2.3 Mine Layout

The proposed site layout is provided in Figure: 2-2.

Although the mine development is at an advanced conceptual phase, the key components and potential options include the following:

- A single large open pit
- A concentrator processing plant (crushing, milling and flotation circuit with a capacity of 40 Mtpa)
- A heap leach, solvent extraction and electrowinning plant (required for future processing)
- A tailings storage facility (TSF)
- A Waste Rock Dump (WRD) (1 500 Mt)
- A solar photovoltaic (PV) plant (150 MWp)
- Mine housing in Noordoewer
- Ancillary infrastructure (access roads, transmission lines, temporary construction camp, offices, etc.).
- Off-channel water storage dam (20Mm³) inclusive of delivery pipeline and booster pump stations (within the EPL 3140)

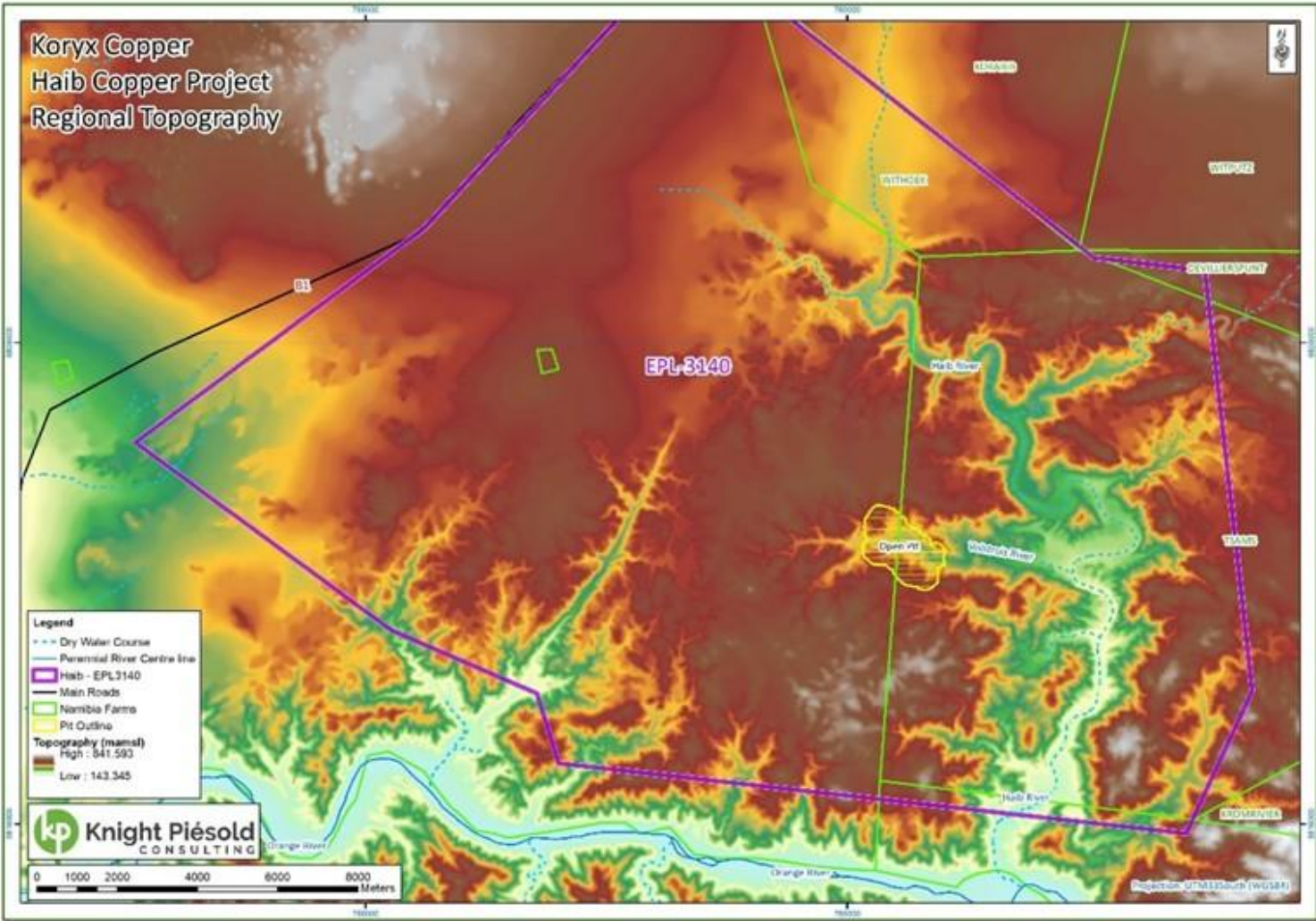


Figure 2-1: Topographical Map of the project area

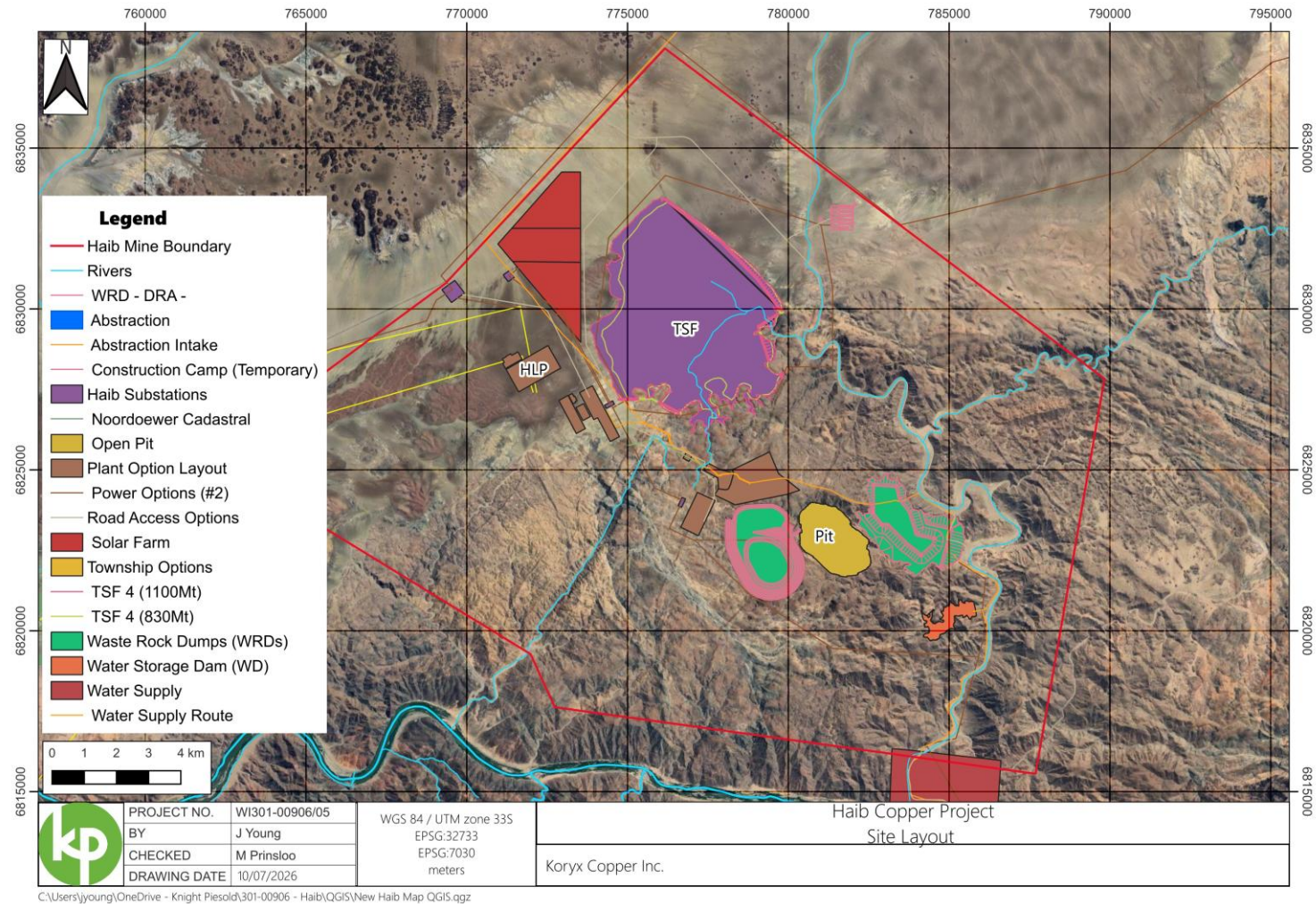


Figure: 2-2: Infrastructure layout plan

2.4 Climate

The Haib Copper Project is in a semi-arid to arid climatic zone, typical of the Namib Desert environment. This classification reflects the region's low annual precipitation, high temperatures, and significant seasonal and diurnal temperature variations.

The project area falls within one of the driest parts of Namibia, a region classified as hyper-arid according to the Köppen-Geiger climate classification system (Kottek et al., 2006).

Rainfall is highly variable and can be sporadic, often in short, intense bursts. Most of the rainfall occurs during summer, primarily between November and March. However, there can be extended dry spells even during the wet season. Based on the available climatic data rainfall varies between 27 mm/yr in a drought period (2017), and 171 mm/yr during the maximum recorded year (2000), with an average of 68 mm (refer to Table 2-1 and Figure 2-3).

The high temperatures and low humidity lead to significant rates of evaporation. The Mean Annual Evapotranspiration (MAEt) is 2119 mm/yr with a maximum of 2273 mm/a recorded in 2017 and a low of 2091 mm/a recorded in 2000 as indicated in Table 2-1. Humidity levels are generally low, contributing to the harsh, arid climate. This low humidity results from the desert environment and contributes to high evaporation rates.

Based on this data, the local catchment has a negative water balance, and groundwater resources require a larger area for recharge. This water availability deficit can lead to drought conditions and affect ecosystem health. Groundwater use requires strict management.

Table 2-1: Rainfall and Evapotranspiration Averages between wet and dry seasons (FAO, 2018 to 2022)

Month	Avg. (1988)		Dry (2017)		Wet (2000)	
	Precipitation (mm)	Evapotranspiration (mm)	Precipitation (mm)	Evapotranspiration (mm)	Precipitation (mm)	Evapotranspiration (mm)
Jan	0	269	7	275	19	252
Feb	13	226	5	228	80	206
Mar	11	184	1	227	43	170
Apr	4	146	0	174	3	146
May	1	122	0	129	0	108
Jun	4	89	2	95	1	96
Jul	3	88	0	108	7	108
Aug	7	126	0	127	0	134
Sep	3	161	0	179	14	148
Oct	2	207	5	217	1	223
Nov	3	242	5	240	3	228
Dec	16	259	0	273	0	271
Total	68	2119	27	2273	171	2091

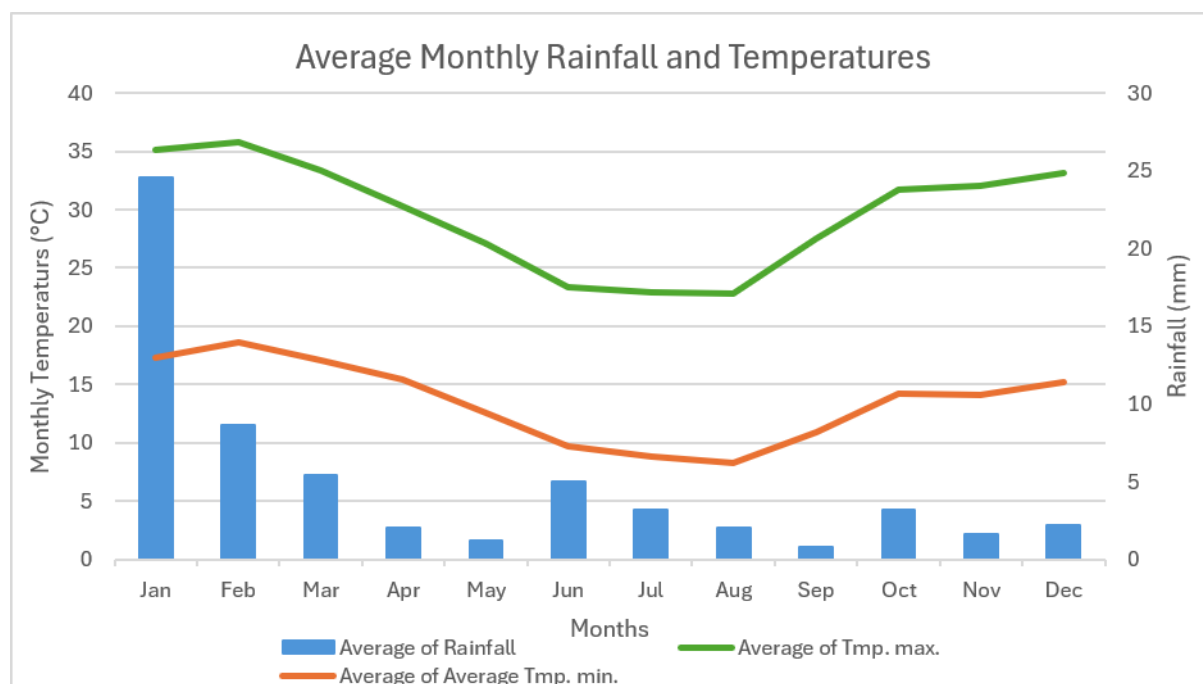


Figure 2-3: Average Monthly Rainfall and Temperature Graph (FAO, 2018 to 2022)

3.0 GEOLOGICAL SETTING

3.1 Regional Geology

The regional geology of the Haib project area is defined by the Namaqua-Natal Metamorphic Belt (NNMB), a Mesoproterozoic terrane forming part of the larger Namaqua-Natal Province. This belt comprises a complex assemblage of high-grade metamorphic rocks and granitoids intruded during the Namaqua Orogeny between 1.3 and 1.0 billion years ago. The NNMB records a protracted history of tectonism, magmatism, and high-grade metamorphism associated with continental collision and accretion events. The geology is structurally complex, exhibiting penetrative folding, transpressional shear zones, and large-scale ductile deformation features that strongly influence modern hydrogeological conditions.

The basement igneous rocks are covered by younger Karoo sediments roughly in the centre of the belt, which are related to the Karasburg Rift Basin, and comprise a basal tillite grading into limestones, siltstones and shales. The basal tillite contains clasts of the Vioolsdrift and Haib basement. The basement and Karoo are all cut by north-west trending dolerite-gabbro dykes and sills of late Cretaceous age.

The Haib license is underlain by the Haib Subgroup volcanics of the Orange River Group (ORG) and Vioolsdrift Intrusive Suite (VIS) rocks on the eastern half, with an unconformity into the Karoo Sediments on the western half (Figure 3-1). The Haib volcanics are primarily composed of a Feldspar Porphyry andesite with minor amounts of intercalated rhyolite in the north. The VIS intrusive are a mix of granodiorite-granite composition rocks, generally forming large batholiths intruding the Haib volcanics

3.2 Local Geology

The Haib project area comprises the regionally greenschist facies of metamorphosed Proterozoic rock units of the Richtersveld terrane (Gordan & McIlwraith, 1998). A simplified geological map of the project area is provided in Figure 3-2.

The Proterozoic rock units are further subdivided into volcano-sedimentary sequence locally known as Orange River Group, Vioolsdrift Intrusive Suite, Richtersveld Intrusive Suite and the Haib recent alluvial cover (Connelly, et al., 2018). Geochronologically, the Orange River Group is the oldest rock units in the study area and represents the spectrum of calc-alkaline volcanic rock types, ranging in composition from basalt to rhyolite (Walker, 2012). It is sub-divided into the Nous Formation and Basal Tsams Formation, which includes the metabasic and metafelsic lavas in the Haib prospect vicinity (Minnet, 1986).

The Feldspar Porphyry (FP) which hosts; the copper mineralization, the volcanic flows of intermediate to acid tuff (Goodhouse subgroup), metamorphosed tuff, undifferentiated granite (Tsams Formation), and chert are dominant units of the Orange River Group (Gordan & McIlwraith, 1998). The Vioolsdrift Intrusive Suite intrudes into the Orange River Group and consists of the mineralized Quartz Feldspar Porphyry (QFP), basic – ultrabasic complexes, diorite, tonalite, granodiorite, adamellite, and leucogranite. These were emplaced during the main two phases of intrusive activities in the Haib area. The Richtersveld Intrusive Suite intrudes into both the Orange River Group and Vioolsdrift Intrusive Suite forming amphibolite, syenite and granite rocks. All these rock groups were eventually overlain by the Haib recent alluvial sedimentary sequence (Indongo, 2017). These lithological and structural characteristics directly control the development and behaviour of the fractured aquifer system described in the following sections.

The major intrusive in the mineralised system is the Quartz Feldspar Porphyry, which is a crowded porphyry containing bluish-rounded quartz and sericitized feldspar phenocrysts in an aphanitic groundmass. This intrusive has also been termed the Haib Porphyry Stock.

A second significant, although volumetrically minor, intrusive is the Quartz Diorite (QD). The QD is very similar in hand specimen to the FP, but contact intrusive relationships show it to be a later intrusive than the QFP. The OD is significant because it has introduced later mineralisation into the system.

The lithology of the rock units making up the site geology is shown in Figure 3-2. The lithology of the site geology is composed of the following:

- Feldspar Porphyry (FP) – Andesitic volcanic and sub-volcanic intrusions
- Quartz Feldspar Porphyry (QFP) - Sub-porphyritic granodiorite
- Quartz Feldspar Porphyry 2 (QFP2) - Porphyritic granodiorite
- Quartz Biotite Porphyry (QBP) - Associated with main alteration-mineralisation event
- X-Porphyry (XP) - Late, dacitic porphyry with its own hydrothermal breccias

Generally, the rock formation within the Haib project site is hard and competent, with both flat and steeply dipping joint sets being well developed.

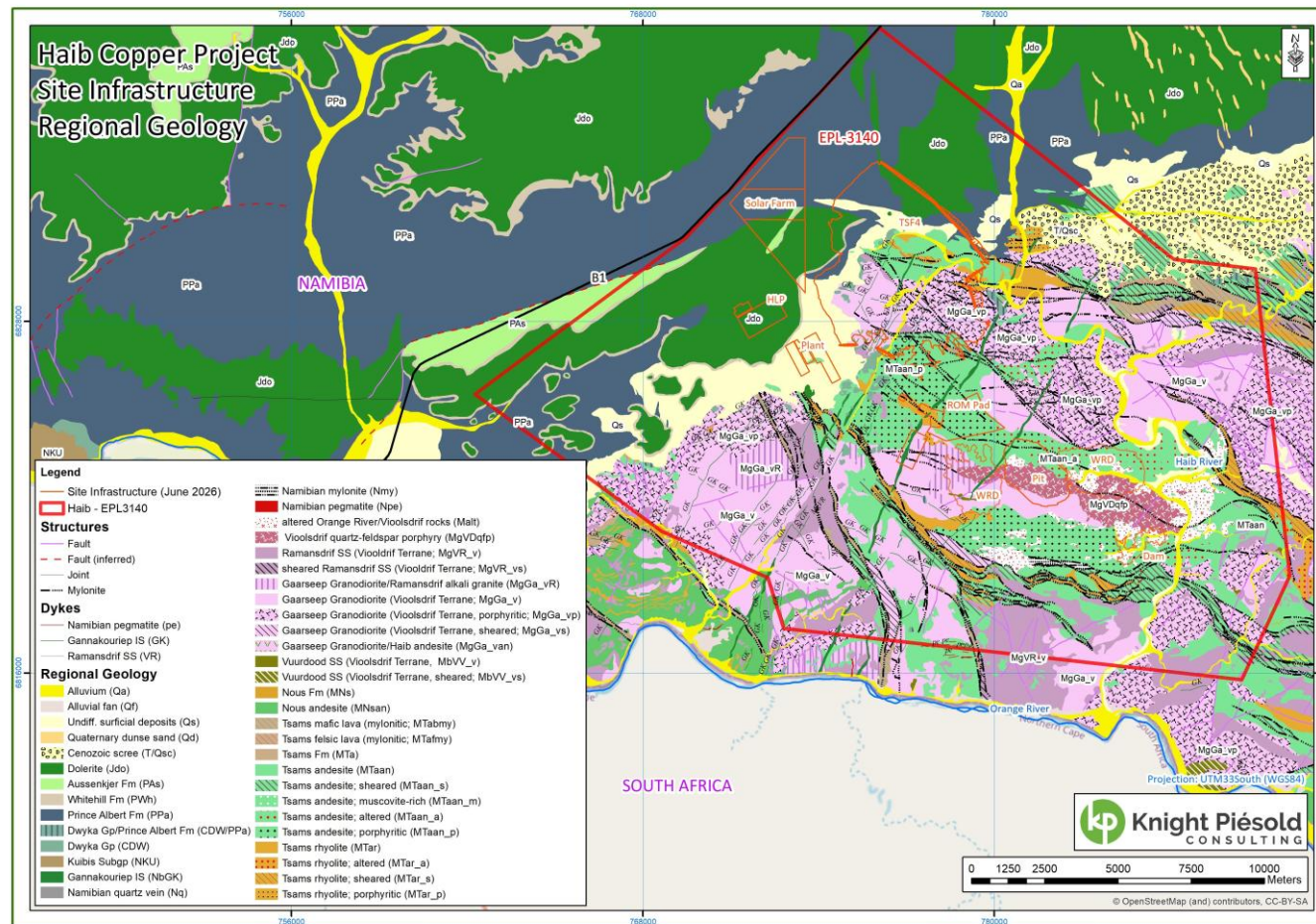


Figure 3-1: Regional Geology: Map showing the general distribution of the Vioolsdrif and Orange River rocks in relation to the Haib Deposit (Teck Namibia, 2015)

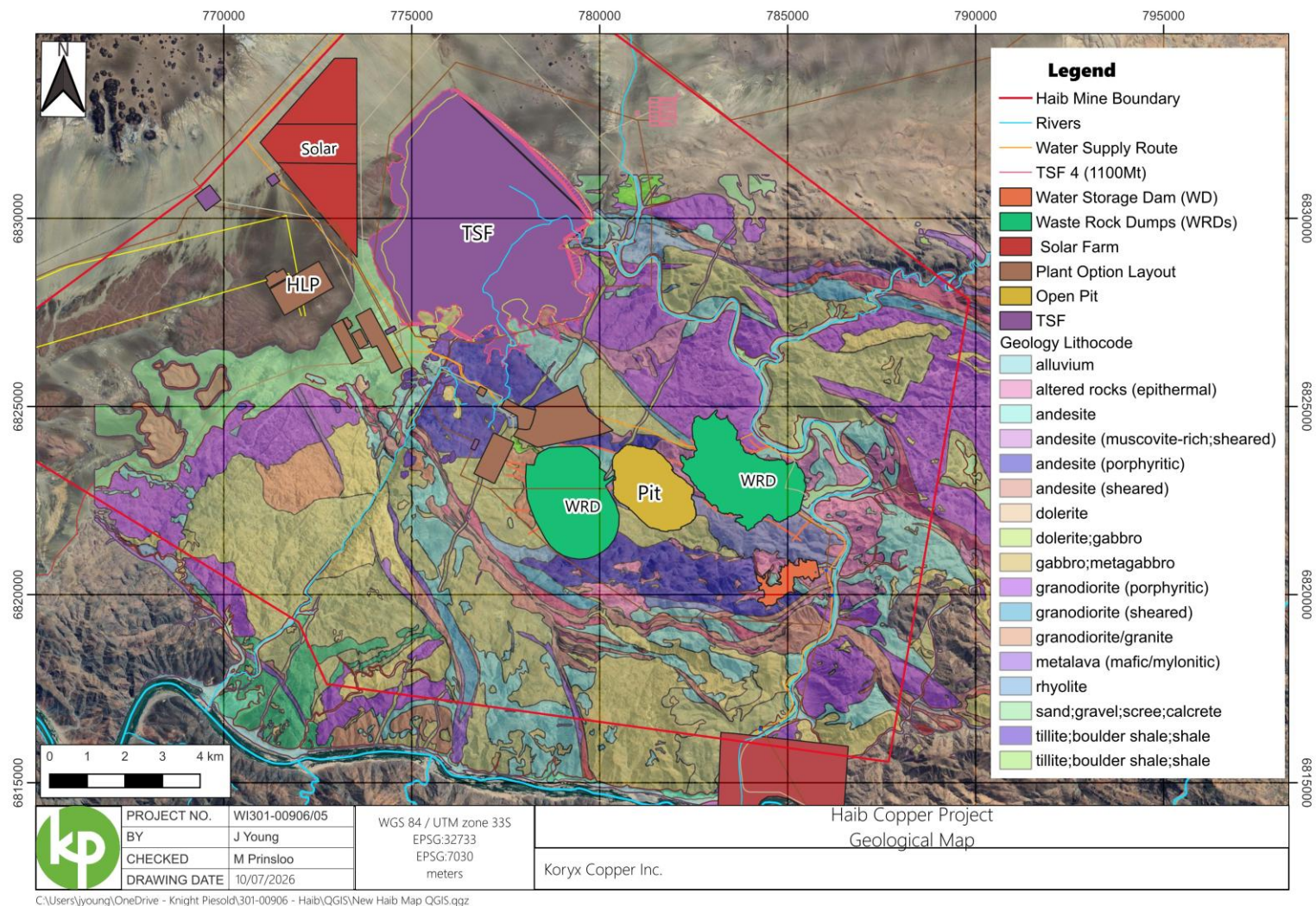


Figure 3-2: Site Geology Map

3.3 Structural Geology

Detailed mapping by Teck geologists within the main deposit area has shown that high grade copper mineralisation is controlled by a fracture/vein set that parallels a regional structural trend and strikes 60° northwest and dips steeply (-70°) to the southwest. This high-grade zone also appears to plunge at 30° to 40° towards the southeast.

Several faults and shears are present in the Haib system, with some of these structures forming the mineralisation boundaries. Detailed mapping by Teck geologists within the main deposit area has shown that high-grade copper mineralisation is controlled by a fracture/vein set that parallels a regional structural trend and strikes 60° northwest and dips steeply (-70°) to the southwest. This high-grade zone also appears to plunge at 30° to 40° towards the southeast.

The largest structure, forming the northern boundary of the mineralisation, runs approximately grid east-west between lines 60°N and 75° north. This can be seen on the surface and in several drill holes. It forms an approximately 100 m wide zone of strong foliation dipping steeply to the north. The nature of this foliation suggests more ductile rather than brittle behaviour.

Another similar, although smaller structure, is oriented towards the north. Again, the dip of this structure is steep. A third shear is interpreted to form the western end of the mineralisation and is oriented northwards, passing through RT drill hole HB78. This has characteristics similar to those of other shear zones.

These three shears all intersect in the vicinity of 60° north, between 120° west and 135° west. One significant brittle fault occurs in the system, striking the grid southwest from 60° north 130° west. This is a scissor fault, having a clockwise sense of rotation. At the western end near its termination in the area where the shears intersect, it breaks up into a flower structure, giving a complex geometry. This can be seen in the interpretation of section 120° west. Again, this structure is sub-vertical (Kvaerner & Minproc, 1998).

The aeromagnetic data shows extensive WNW-SSE faulting along the length of the study area.

4.0 HYDROGEOLOGICAL SETTING

4.1 Aquifers Present on Site

According to the national classification presented in Groundwater of Namibia (Christelis & Struckmeier, 2001), Namibian aquifers are distinguished on the basis of:

- Lithology (consolidated/hard rock versus unconsolidated deposits).
- Dominant porosity and permeability type (intergranular/porous versus fractured, fissured or karstified).
- Groundwater resource potential (from very low to high).
- Groundwater quality, including the occurrence of saline or otherwise poor-quality water.

Within this framework, the project area is underlain predominantly by extrusive and intrusive igneous rocks of the Richtersveld Province, together with the oldest volcanic units of the Orange River Group. These lithologies are reported to be intensely fractured from surface to approximately 40 m below ground level (pers. comm., site geologist). These units form a consolidated, hard-rock aquifer system that is generally characterised by low primary porosity and permeability.

Localised alluvial deposits occur along the main river channels within the study area and represent the principal unconsolidated geological units.

Based on the hydrocensus undertaken by Knight Piésold personnel in March 2025, three main aquifer systems have been identified:

- Shallow alluvial aquifer associated with various surface drainage channels that occur in the study area.
- Upper fractured rock aquifer (0-40 mbgl).
- Deeper fractured rock aquifer (generally deeper than 40 m below ground level).

4.1.1 Shallow Alluvial Aquifer

The alluvial aquifer is developed within unconsolidated to semi-consolidated alluvial and colluvial sediments that are primarily associated with ephemeral drainage lines, including the Haib and Volstruis rivers and their tributaries. As a result of the thin soil cover and extensive bedrock exposure, this unit is laterally discontinuous and confined mainly to riverbeds and adjacent floodplains.

Groundwater occurrence in this aquifer is closely linked to rainfall patterns. Saturation within the alluvial deposits varies seasonally and is controlled by the magnitude and frequency of rainfall events, with rapid recharge from surface runoff during storm flows. Because the water table typically remains below the ground surface, direct evaporative losses are limited, which supports the maintenance of groundwater storage and allows this aquifer to function as a relatively reliable local water source.

The coarse-grained alluvial deposits generally exhibit comparatively higher permeability and storage capacity than the surrounding bedrock. Consequently, the weathered material aquifer plays a key role in the local water balance by:

- Acting as the primary interface for focused recharge from surface runoff into the underlying fractured bedrock aquifers.
- Providing an important source of groundwater supply to surrounding users located along the river corridors. Note that there are no private groundwater users within the sub-catchments potentially impacted by the proposed mining activities.

4.1.2 Upper Fractured Rock Aquifer

The upper fractured rock aquifer is developed within the intensely fractured near-surface zone of the volcanic and intrusive rocks, and this unit is characterised by a well-connected fracture network. Groundwater flow is considered to be predominantly regional in nature due to the interconnectivity of these structures. Recharge occurs both directly from rainfall infiltration and indirectly from surface runoff, including leakage from the overlying alluvial aquifers where present.

The upper fractured rock aquifer is considered sensitive to abstraction, with limited resilience to sustained pumping. This is due to its inherently low recharge, which is largely dependent on focused infiltration from overlying alluvial deposits and preferential flow along structural features.

Structurally, the aquifer is strongly influenced by:

- East–west trending fault systems.
- The north–south-oriented quartz vein system.
- The northern shear zone.

These structures may act either as hydraulic conduits that enhance groundwater flow, or as barriers that compartmentalise the aquifer, depending on their degree of fracturing, mineral infill and connectivity. Further structural and hydraulic characterisation is required to delineate zones of higher productivity and to inform sustainable abstraction planning.

4.1.3 Deeper Fractured Rock Aquifer

This aquifer is hosted within the deeper, less intensely fractured volcanic and granitic rocks underlying the upper fractured zone. Groundwater flow is largely restricted to discrete fractures and structural features, resulting in a more compartmentalised system. Recharge to this unit is primarily via vertical leakage from the overlying intensely fractured aquifer.

4.2 Aquifer Potential

4.2.1 Alluvial aquifer

Yields in the alluvial aquifer are expected to be high, and can exceed 2 L/s. This is based on the high permeability of the alluvial material, and the volume of water that can be in storage in the alluvium. Longterm sustainability of the yields can be limited in areas where the thickness of the alluvial material is reduced, or during sustained drought periods.

4.2.2 Upper fractured rock aquifer

Yields of the upper portion of the fractured rock aquifer can be high, and can be in the order of 1 to 2 L/s, or potentially more in specific cases. The relatively higher yield is due to the interconnectedness of the fractures to a depth of approximately 40 m below surface. The sustainable yield can be reduced during prolonged periods of drought when there is little to no recharge to the aquifer, and in areas where the thickness of the depth of fracturing is reduced.

4.2.3 Deeper fractured rock aquifer

The potential for high-yielding boreholes in the deeper fractured rock aquifer is very low unless individual water-bearing structures are found. Aquifer yields are expected to range between 0.1 and 0.5 L/s on average.

4.3 Groundwater Levels and Flow Patterns

Depth-to-groundwater data for the Haib project area have been compiled from multiple sources, including two hydrocensus surveys undertaken by Knight Piésold in 2023 and 2025, a hydrogeological investigation conducted by Water Sciences in 1997 (Water Sciences, 1997), and routine groundwater level monitoring initiated in 2025. Additional regional groundwater level information is available from the Namibian–German Cooperation Project National Groundwater Database (GROWAS).

During the hydrogeological study carried out by (Water Sciences, 1997), water level measurements were recorded at multiple core drill holes. The observed water levels at these locations ranged from 5.78 to 122.45 meters.

During the KP hydrocensus of 8–9 November 2023, five boreholes and one surface water point were identified. Measured groundwater levels in these boreholes ranged from near surface to 36.97 metres below ground level (mbgl). The subsequent hydrocensus in March 2025 visited 21 boreholes, of which depth to groundwater could be measured in 17; the remaining boreholes were dry, collapsed, or otherwise inaccessible. Please refer to Table 4-1 for the hydrocensus details.

In the boreholes where measurements were possible during 2025, groundwater levels ranged between 1.42 and 39.03 mbgl, which is consistent with the groundwater levels measured during the 2023 hydrocensus. One anomalous measurement of 79.57 mbgl was recorded in 2025; however, this value is considered uncertain due to the inclined drilling of the borehole and the presence of drill mud, which may have affected the accuracy of the reading.

Groundwater levels in boreholes installed in the alluvial aquifer are generally shallow, typically between 0 and 5 mbgl, reflecting the hydraulic connection with riverbeds and associated floodplain deposits. In contrast, groundwater levels in boreholes intersecting the upper and deeper fractured rock aquifers commonly range between approximately 12 and 40 mbgl, consistent with the greater depth and lower storativity of these units.

Plotting the measured groundwater level elevation against the topographical elevation shows an 95.67% correlation (please refer to Figure 4-1). From this, it can be concluded that there is a good correlation between the topographical elevation and the natural groundwater level elevation, and the regional groundwater flow is inferred to broadly follow the surface topography and drainage network, with a predominant component directed southwards towards the Orange River, and ultimately westwards along the Orange River valley to the Atlantic Ocean. At the local scale, groundwater flow paths are expected to be strongly controlled by structural features (faults, fractures, shear zones and intrusive contacts), which may channel flow along preferred directions and locally modify the regional gradient.

Figure 4-2 below displays the boreholes where groundwater level measurements were recorded in 1997, 2023 and 2025.

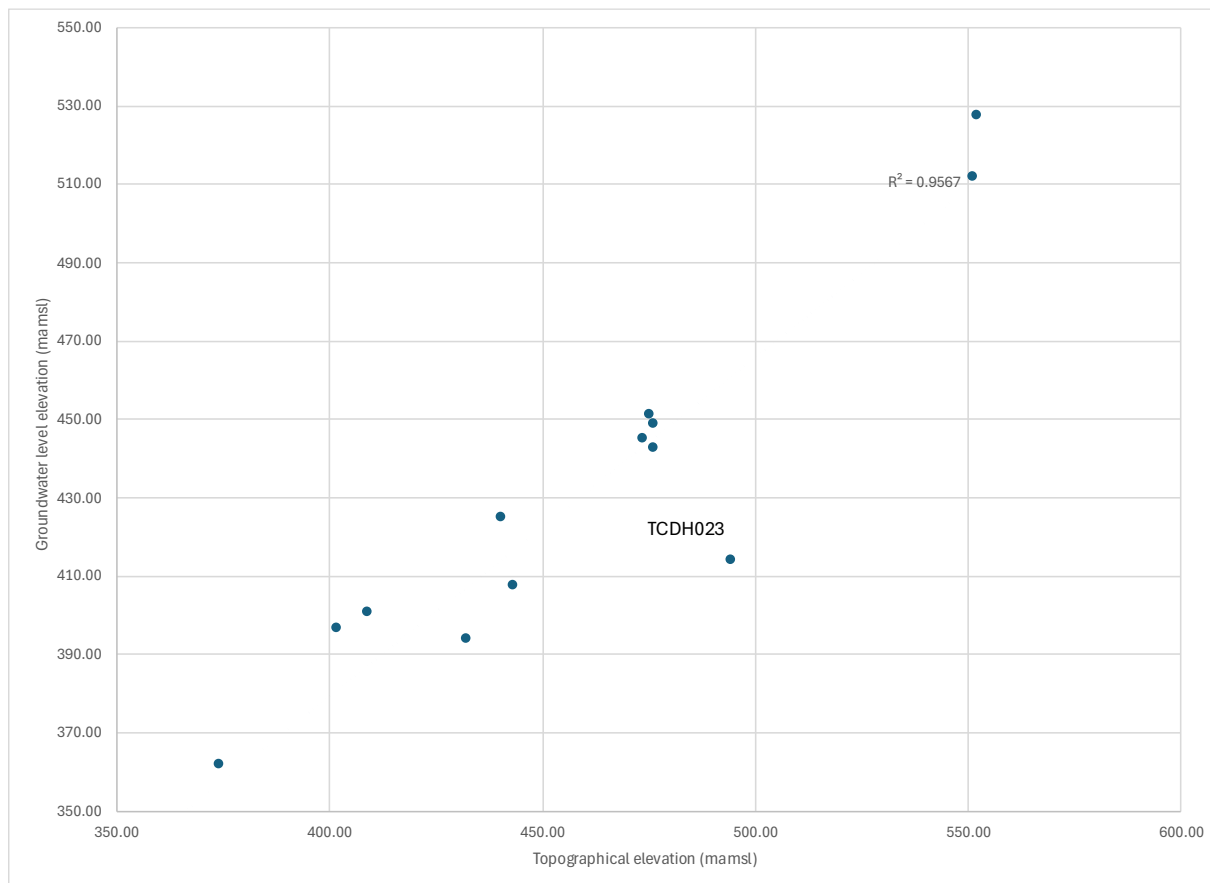


Figure 4-1: Plot of groundwater level elevation against topographical elevation

Table 4-1: 2025 Hydrocensus Points

Borehole	East (UTM33S WGS84)	South (UTM33S WGS84)	Elevation (mamsl)	Collar Height (m)	Water level (mbcl)	Water level (mbgl)	Water level (mamsl)	Open / accessible	Sample collected
Borehole1	785888	6822809	280.75	0.27	1.69	1.42	279.33	Yes	No
Borehole2	785826	6821927	280.14	0.35	7.49	7.14	273.00		Yes
Borehole4	786087	6824582	319.76	0.11	20.52	20.41	299.35	Yes	No
Farm borehole	774451	6831960	551.00	0.1	39.13	39.03	512.07	Yes	No
GFMBH02	781523	6823071	401.39	0.21	4.92	4.71	396.89	Yes	No
GFMBH04	781373	6823118	422.26	Borehole inaccessible				No	No
GFMBH06	780977	6823503	473.29	0.43	28.92	28.49	445.23	Yes	Yes
GFMBH12	781290	6823447	486.08	Borehole inaccessible				No	No
HB001	781897	6822631	408.82	0.52	8.34	7.82	401.00	No	No
HB005	781629	6822835	415.24	Borehole inaccessible				No	No
HM02	781314	6823195	440.00	Borehole is dry				No	No
HM04	781391	6823256	440.00	0.00	14.75	14.75	425.25	Yes	Yes
HM07	781509	6822928	432.00	0.2	38.13	37.93	394.27	Yes	No
HM15	782061	6822555	381.00	Borehole inaccessible				No	No
HM16	782192	6822560	376.00	Borehole inaccessible				No	No
HM17	782374	6822581	374.00	0.13	12.13	12.00	362.13	Yes	No
HM45	781445	6822719	475.00	0.15	23.90	23.75	451.40	Yes	No
HM47	781488	6822864	410.00	Borehole inaccessible				No	No
HM50	781489	6822816	443.00	0.16	35.42	35.26	407.74	Yes	No
HM59	780784	6823562	552.00	0.22	33.8	24.26	527.74	Yes	No
KS05	781633	6823624	473.00	Borehole inaccessible				No	No

Borehole	East (UTM33S WGS84)	South (UTM33S WGS84)	Elevation (mamsl)	Collar Height (m)	Water level (mbcl)	Water level (mbgl)	Water level (mamsl)	Open / accessible	Sample collected
TCDH08	781625	6823561	456.00	Borehole inaccessible				No	No
TCDH020	781600	6823460	476.00	0	33	33.00	443.00	Yes	No
TCDH021	782397	6822631	372.14	Borehole inaccessible				No	No
TCDH022	781265	6822888	458.87	Borehole inaccessible				No	No
TCDH023	778372	6823136	494.00	0.03	79.6	79.57	414.46	Yes	No
TCDH024	778074	6823190	653.00	0	>100	Water level deeper than the dipmeter length		Yes	No
Unnamed1	781353	6823338	476.00	0.12	27.24	27.12	449.00	Yes	No
Near DH012	780490	6823091	430.70	1	21.95	20.95 (pump stopped)	409.75	No - pump in it	Yes
Rainwater	755457	6818704	175.40	Rainwater Sample – collected in Noordoewer				Yes	Yes
Orange River	755025	6818792	157.00	Surface water sample from the Orange River – collected in Noordoewer				Yes	Yes

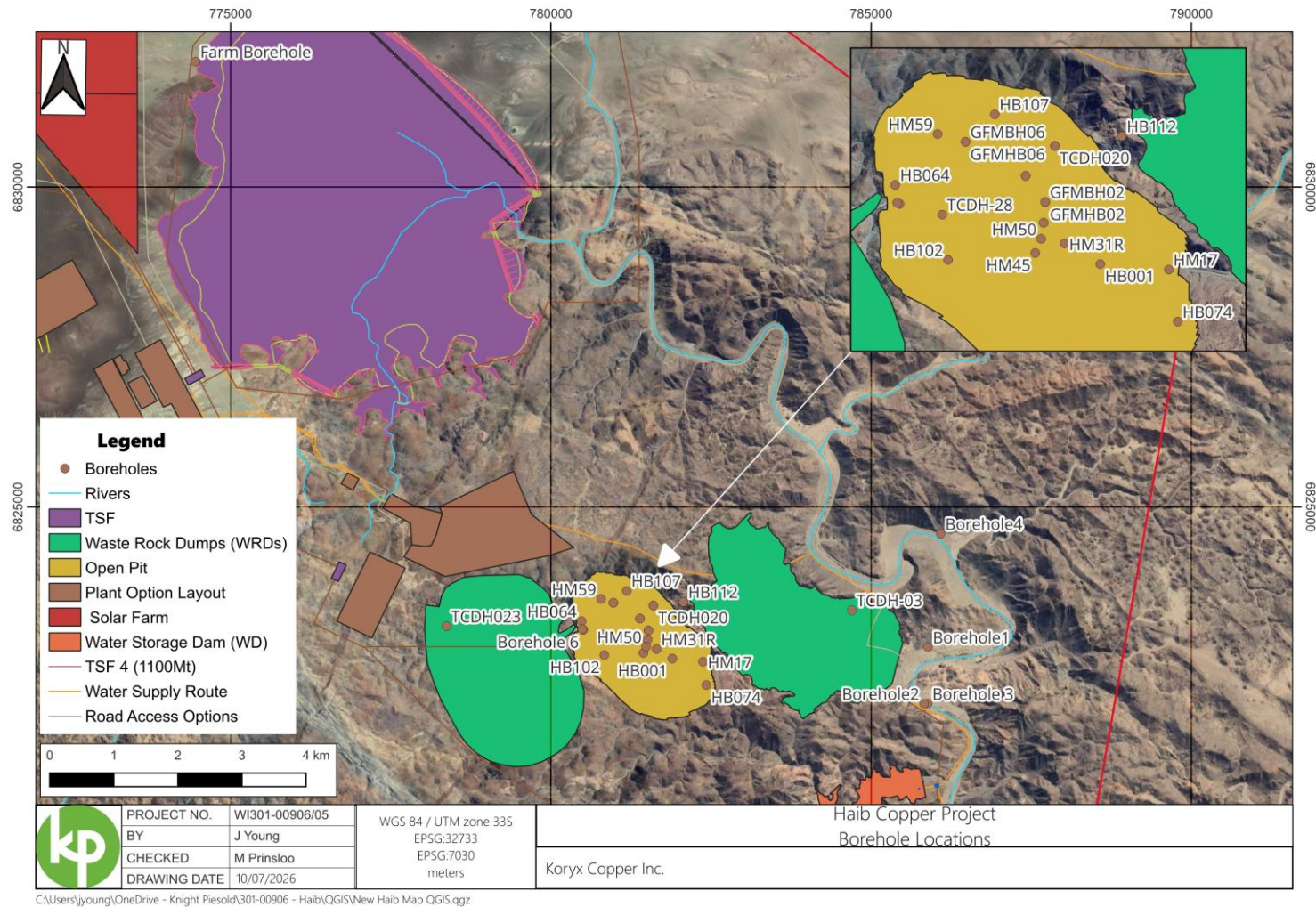


Figure 4-2: Boreholes where water level measurements were recorded

4.4 Groundwater Recharge

Regional climatic conditions are characterised by very low rainfall and extremely high evaporative demand, with an average annual precipitation of approximately 25–50 mm/a and potential evaporation on the order of 3,800 mm/a. Under these arid conditions, regional groundwater recharge is expected to be very limited.

On the basis of regional climate data and hydrogeological conditions, long-term average recharge to the aquifer system is preliminarily estimated to be in the order of 1–2% of the mean annual precipitation (MAP). However, calibration of the numerical groundwater flow model indicates that effective recharge may be significantly lower in places, with values as low as 0.2% of MAP required to reproduce observed groundwater levels and flow patterns.

These estimated recharge rates are consistent with published values for similar arid and semi-arid hard-rock environments in Namibia and adjacent regions of South Africa, where focused recharge along river channels and structural features dominates over diffuse areal infiltration.

4.5 Groundwater Quality

Groundwater quality within the broader Orange River Basin is widely recognised as being influenced by elevated salinity, with comparatively high concentrations of dissolved constituents, including nitrates, fluorides, sulphates, sodium, chloride and carbonate species. Despite this, most groundwater in the Orange–Fish River Basin is generally considered suitable for potable use, although localised areas are affected by excessive fluoride and/or nitrate levels.

Regional groundwater quality is further influenced by anthropogenic activities. Identified pollution hazards include discharges of municipal and industrial wastewater (e.g. sewage effluent), poorly sited landfills and refuse dumps, the use of artificial fertilisers, and large-scale application of agrochemicals, particularly in irrigated agricultural areas downstream of the Hardap and Naute dams. High concentrations of dissolved salts and agricultural/industrial chemicals have been reported as major contributors to groundwater quality degradation in parts of the basin (IWRM Consultants, 1992).

4.5.1 Groundwater Sampling Background

Groundwater samples were collected from core drill holes GFMHB02, HB064, HB074, HB102, HB107 and HB112 between late March and early April 1997 as part of the Water Sciences investigation. Recently, KP personnel undertook two hydrocensus campaigns within the project area. During the November 2023 hydrocensus, five groundwater samples and one surface water sample were collected. A further six groundwater samples were obtained during the second hydrocensus in March 2025 (please refer to Figure 4-3 for the sampling positions).

The 1997 samples were submitted to the Department of Water Affairs (Laboratory and Research Services) and the KP 2023 and 2025 hydrocensus samples were submitted to Analab (Analytical Laboratory Services) for chemical analysis.

Analytical results for the 1997 to 2025 sampling campaigns are presented in both graphical and tabular form and have been evaluated against the applicable water quality standards prescribed under the Namibian Water Resources Management Act, 2013 (Notice No. 8187 of 2023). As detailed in Appendix 1, the updated potable water quality guidelines define ideal guideline values as well as acceptable maximum limits for individual parameters.

Where measured concentrations exceed the relevant threshold values specified in the Water Resources Management Act, these exceedances are highlighted in Appendix 1. In addition, such

parameters are plotted on concentration graphs, with a guideline/limit line showing the maximum permissible value in terms of the Act.

Details of the boreholes sampled in 1997 and 2023–2025 are provided in Table 4-2, and their locations are shown in Figure 4-3.

Table 4-2: Sampled Borehole Information

Hole ID	South (UTM 33S WGS84)	East (UTM 33S WGS84)
Samples 1997		
GFMHB02	781523	6823071
HB064	780480	6823215
HB074	782428	6822218
HB102	780835	6822686
HB107	781186	6823689
HB112	782070	6823516
Samples 2023		
TCDH-28	780804	6823001
TCDH-03	784699	6823386
HM07	781509	6822928
HM31R	781651	6822780
Farm Borehole	774451	6831960
Orange River	782302	6814352
Samples 2025 - 2026		
GFMHB06	780977	6823503
HM04	781391	6823256
TCDH020	781600	6823460
Borehole 6	780507	6823082
Borehole 3	785884	6821927

4.5.2 Field Measurements 2023

During the 2023 hydrocensus campaign, two (2) surface water samples and four (4) groundwater samples were collected. Field parameters were measured in situ using a portable multi-parameter meter (serial number: HI98194). The following parameters were recorded: pH, electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO), oxidation–reduction potential (ORP), resistivity and temperature. Water level measurements and corresponding field readings are summarised in Table 4-3.

The field measurements indicate:

- An average pH of approximately 7.7, indicating slightly alkaline conditions.
- Groundwater (borehole) samples generally exhibit higher EC and TDS values than the surface water samples, reflecting greater mineralisation due to longer water–rock interaction times.

- Elevated ORP values were recorded in the sample from the Farm borehole, suggesting more oxidising conditions at this location relative to other sites.
- The surface water sample has higher DO concentrations than the groundwater samples, as expected, since oxygen is transferred directly from the atmosphere to surface water and is also produced by aquatic photosynthesis, whereas groundwater is typically more isolated from atmospheric exchange.

Table 4-3: Summary of 2023 Field Measurements

BH ID	Temp(°C)	Water Level (mbgl)	pH	EC (µS/cm)	ORP	TDS (mg/l)	DO (mg/l)
TCDH-28	30.3	0	7.8	799	174.3	387	0.48
TCDH-03	30.3	5.0	7.7	2240	65	603	2.71
HM07	33.6	39.0	7.7	1170	74	588	3.72
HM31R	31.8	36.97	7.8	799	174.3	387	048
Farm Borehole	23.9	-	7.3	2200	382.2	1101	2.45
Orange River	34.1	-	7.8	268	211.7	133	4.21

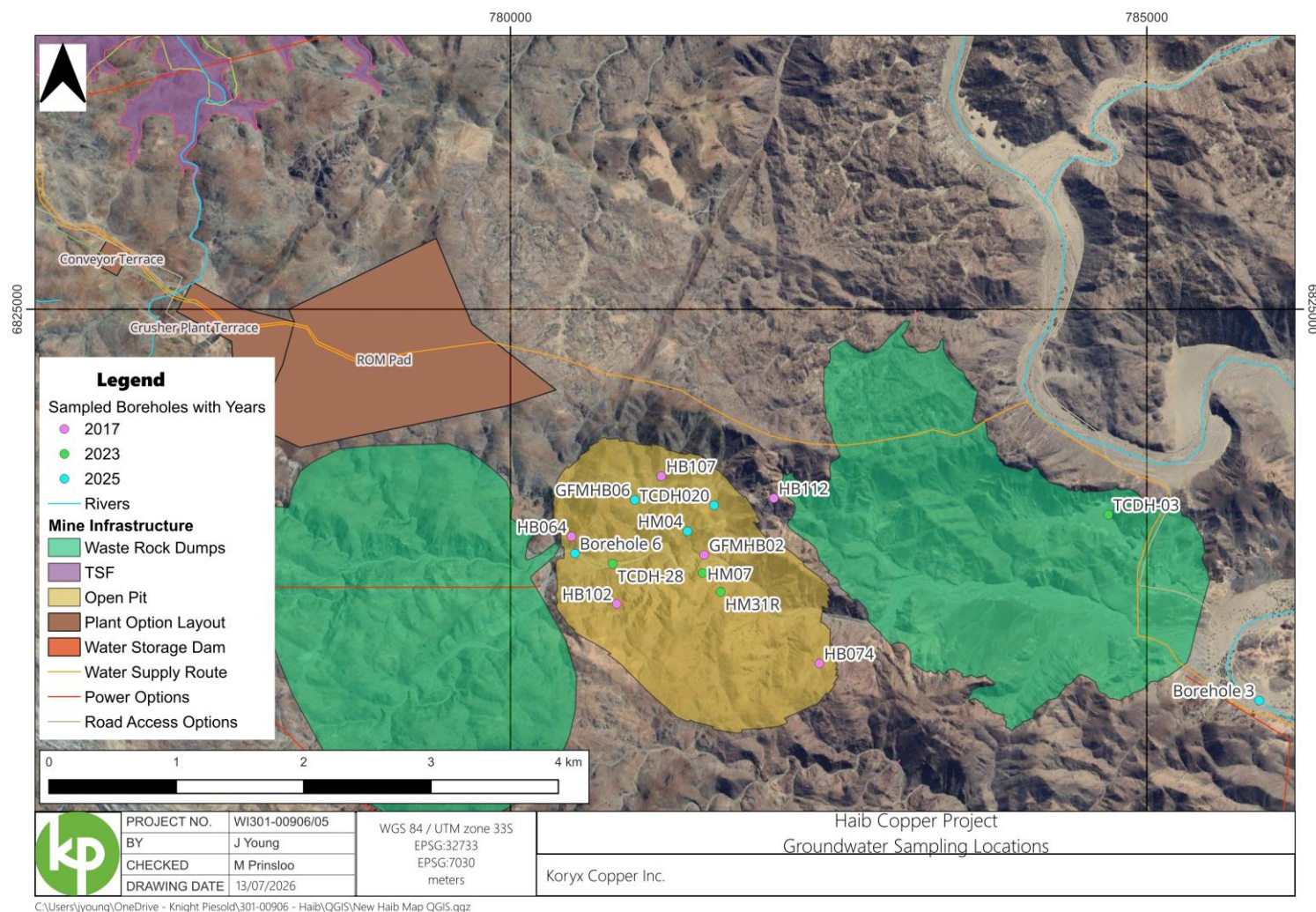


Figure 4-3: Water sample locations taken in 1997, 2023 and 2025

4.5.3 Hydrochemical Analysis Results – Element Concentrations

Groundwater quality data from 1997, 2023 and 2025 was evaluated against the Namibian drinking water and agricultural water use standards. Please refer to Figure 4-4 to Figure 4-7 for graphical presentations and Table 4-4 – note that Table 4-4 only lists the February 2026 groundwater qualities.

- **pH:** All groundwater samples (1997–2025) exhibit alkaline pH values, consistent with the geochemical setting of the area.
- **Electrical Conductivity (EC):** EC values for all groundwater samples exceed the ideal guideline limits, indicating elevated salinity and a high degree of mineralisation.
- **Total Dissolved Solids (TDS):** All samples show elevated TDS concentrations, consistent with the high EC values and confirming that the groundwater is highly mineralised.
- **Fluoride (F):** Fluoride concentrations in the 1997 samples are below the acceptable standard. In contrast, several of the 2023 samples show elevated fluoride concentrations above guideline values, indicating a deterioration in this parameter at some locations.
- **Sulphide (as S or related species):**
 - 1997: Sulphide concentrations range from 94 mg/L to 890 mg/L, with the highest value recorded in borehole HB112, located approximately 488 m northeast of the site.
 - 2023 and 2025: Sulphide levels in most samples exceed the acceptable limits of the updated Namibian standards, indicating a persistent and widespread issue.
- **Chloride (Cl):** All samples from 1997–2025 have chloride concentrations above acceptable limits, reflecting high salinity and the influence of both local geology and the arid climate.
- **Nitrate (NO₃):** Borehole HB102, located near the Haib River, and the farm borehole record nitrate concentrations above the acceptable standard. All other monitored points remain within Namibian nitrate limits. The elevated nitrate at the farm boreholes is likely related to agricultural practices (e.g. fertiliser use, livestock waste).
- **Surface water quality:** The available surface water samples (2023) comply with the updated Namibian water quality standards for all assessed parameters.
- **Calcium (Ca) and Magnesium (Mg):** All groundwater samples (1997–2025) show elevated Ca and Mg concentrations. Although these levels are not expected to cause direct health effects, they will promote hardness-related scaling. Precipitation of calcium and magnesium carbonates is likely to cause encrustation and blockages in pipes and damage or reduced efficiency of water-related equipment (e.g. pumps, data loggers) over time.

Overall, groundwater quality in the Haib area is generally poor, with most samples exceeding the ideal and in many cases the acceptable guideline values of Namibia's updated water quality standards. Elevated sodium (Na), chloride (Cl) and sulphate (SO₄) concentrations are attributed mainly to the local geology and the arid climatic conditions that favour concentration of dissolved salts.

The high Na and Cl levels impart a noticeably salty taste and may cause health effects such as nausea and dehydration, particularly for sensitive consumers. Elevated SO₄ concentrations can cause gastrointestinal discomfort, including diarrhoea. On the basis of these exceedances, the groundwater, in its untreated state, is considered unsuitable for human consumption and would require appropriate treatment and/or blending before being used as potable water.

Aluminium concentration in the alluvials has been shown to be in the range of 0.0074 to 0.76 mg/L with an average of 0.04 mg/L. The natural groundwater in the fractured rock aquifer have an aluminium concentration with a median of 0.187 mg/L, and a mean of 0.303 mg/L, both of which exceeds the Namibian drinking water guideline for excellent water of 0.15 mg/L.

Table 4-4: Groundwater chemical analysis results (August 2025)

Parameter	Units	Human Consumption	Livestock Watering	Borehole 3	Borehole 6	HM04	GFMBH06	TCD020
pH		6-9		7.3	7.3	8.1	6.5	7.2
Electrical Conductivity	mS/m	<300		986	156.1	99.1	159.7	45.9
Turbidity	NTU	<2.0		0.30	1.3	14	20	33
Total Dissolved Solids	mg/l	<2000	6000	6606	1046	664	1070	308
P-Alkalinity as CaCO ₃	mg/l	-		<10	<10	<10	<10	<10
Total Alkalinity as CaCO ₃	mg/l	-		270	210	370	215	95
Total Hardness as CaCO ₃	mg/l	<1000		1374	482	152	708	166
Ca-Hardness as CaCO ₃	mg/l	-	2500	909	367	45	564	130
Mg-Hardness as CaCO ₃	mg/l	-	2057	465	115	107	144	37
Chloride as Cl ⁻	mg/l	<300	1500-3000	1820	152	62	92	21
Fluoride as F ⁻	mg/l	<1.5	2.0-6.0	5.5	1.4	0.9	1.2	0.6
Sulphate as SO ₄ ²⁻	mg/l	<300	1000	2552	380	52	552	93
Nitrate as N	mg/l	<11	100	1.2	<0.5	1.1	0.7	1.4
Nitrite as N	mg/l	<0.15	10	<0.01	<0.01	0.16	0.01	0.11
Ammonia nitrogen as N	mg/l	<0.50		<0.02	0.02	10	0.44	<0.02
Free Cyanide as CN ⁻	mg/l	<0.05		0.07	0.02	0.01	0.02	0.01
Bromide as Br ⁻	mg/l	<1.0		6.3	0.48	0.40	2.0	0.48
Iodine as I ⁻	mg/l	-		3.1	0.32	0.63	2.3	0.76
Sodium as Na	mg/l	<300	2000	1666	120	108	67	21
Potassium as K	mg/l	<100		22	1.8	44	8.8	4.7
Magnesium as Mg	mg/l	<70	500	113	28	26	35	8.9
Calcium as Ca	mg/l	<150	1000	364	147	18	226	52
Barium as Ba	µg/l	<2000		57	15	36	35	26
Aluminium as Al	µg/l	<100		76	7.4	123	220	864
Antimony as Sb	µg/l	<50		<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic as As	µg/l	<50		32	2.0	1.2	1.9	<1.0
Beryllium as Be	µg/l	<5		<1.0	<1.0	<1.0	<1.0	<1.0
Bismuth as Bi	µg/l	<500		<1.0	<1.0	<1.0	<1.0	<1.0
Boron as B	µg/l	<500		1779	287	97	144	71
Cadmium as Cd	µg/l	<10		<1.0	<1.0	<1.0	<1.0	<1.0
Chromium as Cr	µg/l	<100		12	<1.0	18	4.9	7.3
Cobalt as Co	µg/l	<500		2.2	<1.0	1.2	22	6.1
Copper as Cu	µg/l	<2000		57	5.5	26	189	146
Iron as Fe	µg/l	<300		4689	1656	14537	7083	6329
Lead as Pb	µg/l	<50		<1.0	<1.0	<1.0	5.0	3.0
Manganese as Mn	µg/l	<100		125	75	551	4048	572
Mercury as Hg	µg/l	<2		7.7	<1.0	<1.0	<1.0	<1.0
Nickel as Ni	µg/l	<150		<1.0	<1.0	<1.0	<1.0	29
Selenium as Se	µg/l	<50		44	3.5	1.5	2.1	<1.0
Titanium as Ti	µg/l	<300		20	3.8	5.2	10	25
Tin as Sn	µg/l	<200		7.0	<1.0	18	21	33
Thallium as Tl	µg/l	<10		<1.0	<1.0	<1.0	<1.0	<1.0
Uranium as U	µg/l	<15		16	1.9	<1.0	1.1	<1.0
Vanadium as V	µg/l	<500		30	2.0	1.3	3.4	3.0
Zinc as Zn	µg/l	-		<1.0	5.6	12	38	171
Stability pH, at 25°C				6.6	7.0	7.7	6.8	7.8
Langelier Index	corrosive			0.7	0.3	0.4	-0.3	-0.6
Ryznar Index	stable			5.9	6.7	7.2	7.1	8.3
Corrosivity ratio	increasing corrosive tendency			19.4	2.9	0.4	3.3	1.3
XXXXXX	Exceed human consumption guidelines							
XXXXXX	Exceed livestock watering guidelines							



Figure 4-4: pH-EC of water samples taken in a) 1997 b) 2023 and c) 2025



Figure 4-5: Major Anions of Water Samples (1997)

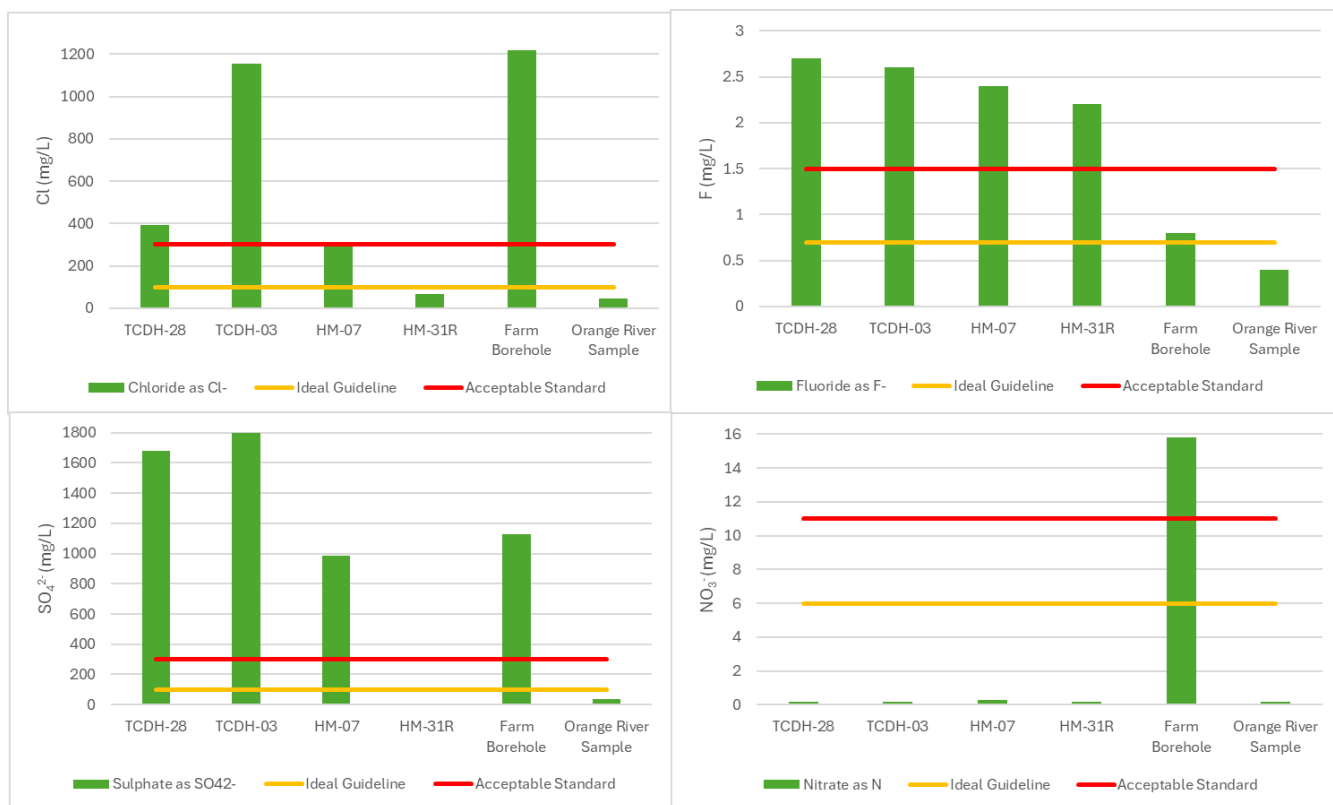


Figure 4-6: Major Anions of Water Samples (2023)

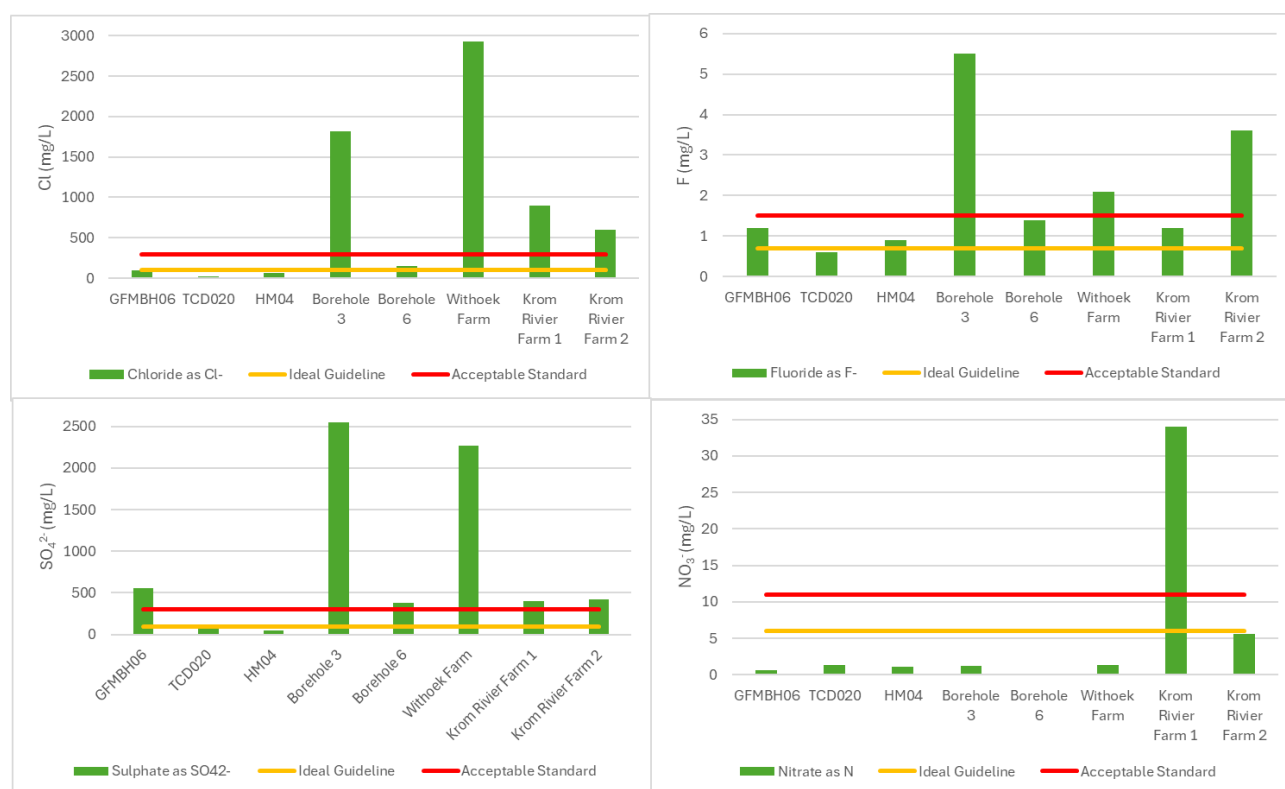


Figure 4-7: Major anions of water samples (2025)

4.5.4 Hydrochemical Analysis Results – Groundwater Character

Groundwater samples collected between 1997 and 2025 were plotted on a Piper diagram to compare the major-ion chemistry of different water sources and to assess any temporal or spatial changes in dominant cation–anion facies (Figure 4-8).

1997 samples: All six 1997 groundwater samples display a similar hydrochemical facies and plot in the upper sector of the central diamond field, corresponding to a calcium/sodium–sulphate (Ca–Na–SO₄) type water. This indicates:

- Dominance of Ca and Na among the cations.
- Dominance of SO₄ among the anions.

The close grouping of these points suggests limited variation in major-ion chemistry across the investigated boreholes at that time.

2023 samples: The 2023 data show greater diversification in water types:

- Samples TCDH-28, TCDH-03, HM-07 and the Farm Borehole plot towards the right-hand corner of the diamond, indicating a sodium–chloride (Na–Cl) to brine-type water. This reflects strong salinisation and evaporation/concentration effects, and/or prolonged water–rock interaction.
- The Orange River surface water sample and groundwater sample HM-31R plot towards the lower part of the diamond, consistent with a sodium–bicarbonate–chloride (Na–HCO₃–Cl)

facies, indicative of comparatively fresher water with a stronger bicarbonate component and lower overall salinity.

2025 samples: The 2025 Haib samples (Figure 4-8) confirm that groundwater is dominated by Cl and SO₄ as major anions, and Ca and Na as major cations. Two main hydrochemical groups are evident:

- **Group 1: Mixed Ca–Mg–Cl type:** Waters with mixed Ca–Mg as dominant cations and Cl as the principal anion, indicative of hard, saline groundwater.
- **Group 2: Na–Cl type:** Waters in which Na and Cl dominate, consistent with more evolved, saline, and locally brackish to brine-type conditions.

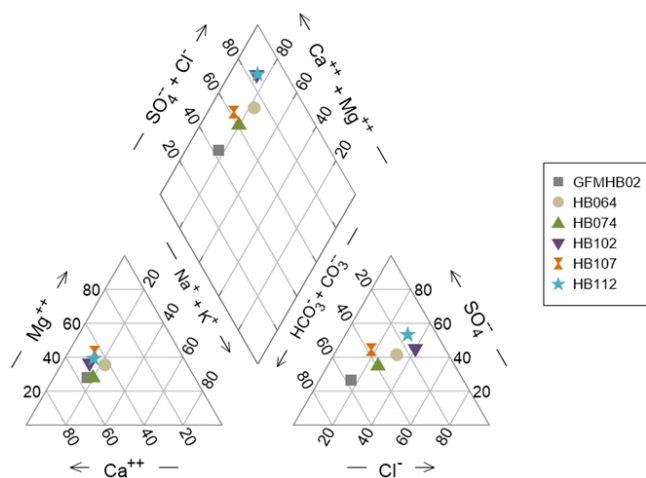
Borehole HM04 plots separately, towards the lower sector of the diamond, and is classified as a Na–HCO₃ water type. This suggests a comparatively less mineralised groundwater, possibly influenced by more recent recharge and/or differing flow paths and water–rock interaction processes relative to the other Haib boreholes.

Comparison with nearby Kromrivier and Withoek farm boreholes: Water samples from nearby farms were also compared to the Haib mine samples:

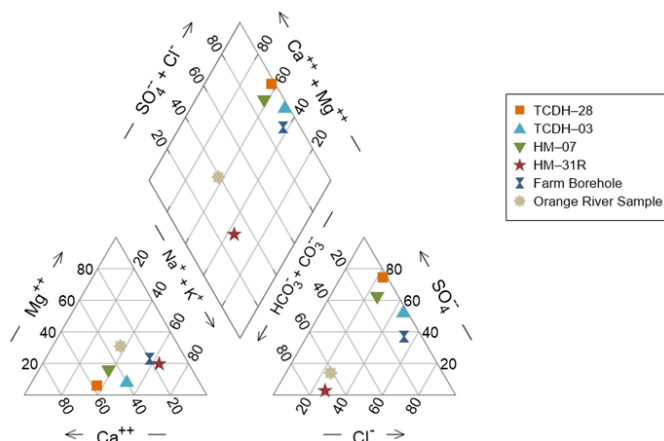
- Farm boreholes generally show similar chemistry to the Haib mine boreholes, indicating a common regional hydrochemical signature.
- The Kromrivier and Withoek farm samples plot closely to Borehole 3 (Haib River), reflecting comparable mixed Ca–Mg–Cl or Na–Cl characteristics.
- A second Kromrivier sample (Borehole 1) exhibits a chemistry similar to GFMBH06, reinforcing the interpretation that both mine and farm abstractions tap into the same or closely connected hydrochemical systems.

Overall, the Piper diagram analysis indicates that groundwater in the Haib area is predominantly saline, with Ca–Mg–Cl and Na–Cl facies dominating, and only isolated occurrences of comparatively fresher Na–HCO₃-type water. The evolving trend from Ca–Na–SO₄ (1997) towards more Na–Cl-dominated types in some 2023–2025 samples suggest increasing salinity and/or longer residence times in parts of the aquifer system.

a) Haib Water Samples 1997



b) Haib Water Samples



c) Haib Mine samples

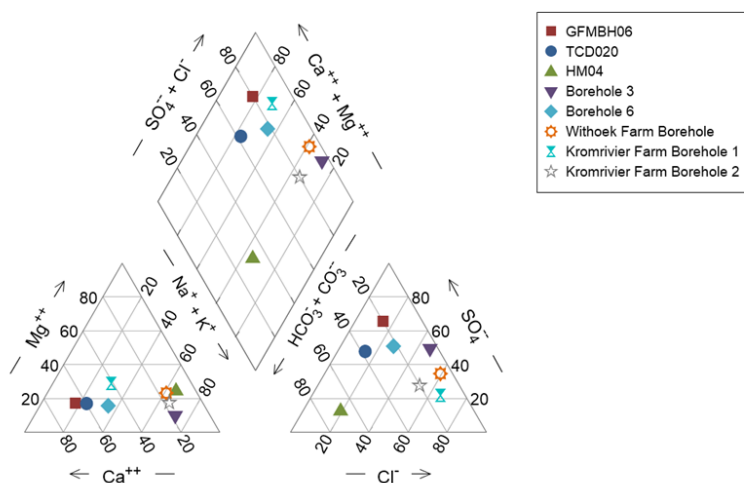


Figure 4-8: Piper diagram of the sampled boreholes taken in a) 1997 b) 2023 and c) 2025

5.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

Three aquifers are identified in the project area:

- A shallow aquifer associated with the alluvial deposits and river channels. These aquifers are recharged mainly by runoff during rainfall events.
- The upper portion (surface to 40 m depth) of the fractured rock aquifer, where the lithologies are intensely fractured. Groundwater flow in this aquifer is considered to be regional due to the interrelatedness of the fractures. This aquifer is recharged by rainfall and surface runoff.
- A deeper fractured rock aquifer system representative of the volcanic rock and granitic rocks present in the project area. Here groundwater flows are along individual fractures. Recharge is from the overlying intensely fractured aquifer.

The faults, veins and shears in the project area that could control groundwater flow patterns in the upper and deeper fractured rock aquifers predominantly trend east-west and dip south, while a minor amount are trending north-south and dipping east. The structural geology is dominated by an east-west fault, and a North-South Quartz vein, while towards the North is the Northern shear zone.

It is suspected that the aquifer system in the western portion of the project area is slightly shallower than the eastern portion, due to the presence of sedimentary rocks of the Karoo sediments in the western portions.

Groundwater levels in boreholes installed in the alluvial aquifer are generally shallow, typically between 0 and 5 mbgl, reflecting the hydraulic connection with riverbeds and associated floodplain deposits. In contrast, groundwater levels in boreholes intersecting the upper and deeper fractured rock aquifers commonly range between approximately 12 and 40 mbgl, consistent with the greater depth and lower storativity of these units.

The regional groundwater flow is inferred to broadly follow the surface topography and drainage network, with a predominant component directed southwards towards the Orange River, and ultimately westwards along the Orange River valley to the Atlantic Ocean. At the local scale, groundwater flow paths are expected to be strongly controlled by structural features (faults, fractures, shear zones and intrusive contacts), which may channel flow along preferred directions and locally modify the regional gradient.

The heap leach pad, TSF and water ponds for the mine processing are located in the western portions of the project area. This could potentially increase the local water table creating a mounding effect beneath these facilities. The WRD will behave similarly to these facilities in that a groundwater flux will occur during rainfall periods, precipitation will slowly infiltrate through WRD and seep into the ground. This will result in a local rise in water level around the WRD.

6.0 GEOCHEMICAL ASSESSMENT

Groundwater flow processes and aquifer characteristics, as described in the preceding sections, exert a primary control on groundwater chemistry and geochemical evolution at the Haib site. The geochemical baseline investigations therefore complement the hydrogeological conceptual model by defining pre-mining chemical conditions for both water resources and mine materials.

Available historical leach testing for the Haib deposit was completed prior to 2008. In accordance with current Global Industry Standard on Tailings Management (GISTM) requirements, an updated geochemical assessment was necessary. As part of this PFS, Knight Piésold undertook an update to the characterisation, with the aim to define the spatial distribution and variability of key geochemical parameters (including sulphur content, acid-neutralising capacity, and bulk elemental composition), as well as the acid-generating and metal-leaching characteristics of the different material types.

Preliminary acid–base accounting (ABA) and static testing performed as part of the KP study indicated that the majority of tested samples are non-acid generating. However, some materials, particularly non-oxidised high-grade oxidised material, are classified as uncertain with respect to acid-generation potential. Based on this, additional characterisation was therefore required to resolve this uncertainty. In line with these findings, further samples were collected and submitted for kinetic testing to better define the long-term acid rock drainage (ARD) and metal leaching potential at the Haib mine. Once these results were available, a geochemical model was developed to simulate the expected geochemical reactions that are expected to occur at the TSF, the low-grade ore stockpile, the WRD, and the pit to calculate the expected leach and water qualities at these points during the life of operations.

The staged approach ensured that both the short-term behaviour of near-surface oxidised material and the long-term behaviour of sulphide-bearing material were adequately represented in the baseline dataset. All samples were submitted to X-Lab Earth (South Africa) for:

- Acid–base accounting.
- Static leach testing.
- Kinetic leach testing.
- Total elemental analysis.
- Mineralogical characterisation.

The overall objective was to assess the acid-generation potential and metal-leaching behaviour of mine materials under anticipated operational conditions, and to provide a robust geochemical baseline to support impact assessment, mine design and long-term water management planning

6.1 Static Testing

The geochemical sampling program was planned based on the resource classification and project plan that was available at the time (March 2025):

- High grade material. Ore with a copper content of >0.3 % will be processed in the plant.
- Low grade material. Ore with a copper content between 0.1 and 0.3 % will be processed on the heap leach facility.
- Waste. Material with a copper content of <0.1 %.
- Tailings material. Material representative of metallurgical circuit cleaner test #4 performed by Maelgwyn Africa.

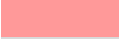
A total of 14 samples were collected in March 2025 by KP from the available exploration drilling core. The sampling program made provision for waste, high-grade, and low-grade material, and also takes into consideration state of oxidation to capture distinct geochemical variations at various depths. In addition, a composite sample of tailings produced under pilot testing from open circuit cleaner test #4 at a grind of 150 micron was obtained for geochemical analysis. The geochemical test work was carried out by X-Lab, a SANAS (South African National Accreditation System) accredited laboratory.

Overall, the samples collected are considered to be representative of the material that will be mined and stored on site. The detailed sample information for the static geochemical testing is shown below in Table 6-1.

Table 6-1: Geochemical sample information

No	Sample Id	Interval Sampled	Material Description
1	HAIB -HM12	192 - 214 m.	Non oxidised. High grade material.
2	HAIB- HM22/1	384 - 396 m.	Non oxidised. Mostly low-grade material, with some waste.
3	HAIB- HM22/2	28 - 42 m.	Non oxidised hanging wall. Low grade material
4	HAIB- HM22/3	370 - 382 m. 392 - 396 m.	Non oxidised foot wall. Low grade material
5	HAIB- HM22/3 (Duplicate)	370 - 382 m. 392 - 396 m.	Non oxidised foot wall. Low grade material
6	HAIB - HM24	4 - 20 m.	Transition zone. Low grade material, with some waste.
7	HAIB - HM28/1	124 - 134 m.	Non oxidised zone 1. High grade material.
8	HAIB - HM28/2	182 - 186 m. 192 - 196 m.	Non oxidised material. Low grade. Non oxidised material. Waste rock - non mineralized
9	HAIB - HM31R	2 - 28 m.	Oxidised Zone. High grade material.
10	HAIB - HM33	82 - 86 m. 94 - 98 m.	Non oxidised. Low grade material.
11	HAIB - HM42/1	24 - 44 m.	Non oxidised Zone 2. High grade material.
12	HAIB - HM42/2	54 - 56 m.	Non oxidised hanging wall. Low grade material.
13	HAIB - HM42/3	220 - 246 m.	Non oxidised zone 1. High grade material.
14	HAIB - HM42/4	12 - 14 m.	Oxidised hanging wall. Low grade material
15	Tailings	Composite	Composite sample of tailings produced under pilot testing from open circuit cleaner test #4 at a grind of 150 micron.

Key

	Non-oxidised high grade		Transitional zone low grade
	Non-oxidised low grade		Transition zone waste
	Oxidised high grade		Non-oxidised waste
	Oxidised low grade		Tailings material

Geochemical static testing results were evaluated against the Namibian drinking water guideline, the IFC mine effluent guidelines, and the South African Waste Classification Regulations to assess the acid-generation potential and leachability of the various material types. A summary of the geochemical and acid–base accounting (ABA) results is provided in Table 6-2.

The geochemical assessment indicates that the high-grade (non-oxidised) material presents the highest inherent geochemical risk to underlying aquifers and the surrounding environment/receptors due to it being classified as Potentially Acid Generating (PAG). Aluminium concentrations in leachate emanating from the material are expected to exceed the Namibian guidelines.

In practice, this risk is mitigated by the planned mine schedule: high-grade material will be stockpiled only for relatively short periods prior to processing, thereby limiting the extent of oxidation and associated geochemical reactions. Following processing, the resultant tailings will be deposited in the tailings storage facility (TSF) for long-term storage.

Leach results from the other material types indicate that aluminium and iron in general is expected to exceed the Namibian drinking water guideline.

The ABA results for the tailings material classify it as potentially acid-neutralising (PAN). On this basis, the development of sustained acidic conditions within the TSF is not anticipated, provided that the current understanding of material characteristics and management practices remains valid. Leachate generated from the TSF is therefore expected to be of comparatively good quality and is predicted to, with the exception of aluminium comply with:

- IFC mine effluent guidelines.
- Namibian mining effluent discharge guidelines.

Based on the static leach test results, aluminium concentrations in leachate are expected to be in the order of 1.2 mg/L, which exceeds the Namibian drinking water value for excellent quality water of 0.15 mg/L (aligned with the World Health Organization potable water guideline). No specific threshold values for aluminium are provided in the IFC mine effluent guideline or the South African Waste Classification leach limits. Note that these expected concentrations were further evaluated based on the kinetic testing and geochemical modelling results.

In summary, although the non-oxidised high-grade ore has the highest intrinsic geochemical risk, its limited stockpile residence time and the neutralising capacity of the tailings indicate that:

- Long-term acid rock drainage from the TSF is unlikely.
- Leachate will generally meet applicable effluent standards, with aluminium representing the primary parameter of concern requiring continued monitoring and, if necessary, management or treatment.

Table 6-2: Static testing results

No	Sample Id	Material Description	Classification	Total concentration exceeds TCT0	Leach Concentrations exceeds guidelines
1	HAIB - HM12	Non oxidised. High grade material.	PAG	Ba, Mo	Al -Namibian
2	HAIB- HM22/1	Non oxidised. Mostly low-grade material, with some waste.	Uncertain	-	Al -Namibian
3	HAIB- HM22/2	Non oxidised hanging wall. Low grade material	Uncertain	-	Al -Namibian Fe - Namibian
4	HAIB- HM22/3	Non oxidised foot wall. Low grade material	PAN	Ba, Mo	Al -Namibian
5	HAIB- HM22/3 (Duplicate)	Non oxidised foot wall. Low grade material	PAN	Ba	Al -Namibian
6	HAIB - HM24	Transition zone. Low grade material, with some waste.	Uncertain	-	Al -Namibian Fe - Namibian
7	HAIB - HM28/1	Non oxidised zone 1. High grade material.	Uncertain	-	Al -Namibian Fe - Namibian
8	HAIB - HM28/2	Non oxidised material. Low grade and waste.	PAN	Ba	Al -Namibian
9	HAIB - HM31R	Oxidised Zone. High grade material.	PAN	Pb, Mo	Al -Namibian Fe - Namibian Cu- IFC Mo - LCT0
10	HAIB - HM33	Non oxidised. Low grade material.	Uncertain	Mo	Al -Namibian
11	HAIB - HM42/1	Non oxidised Zone 2. High grade material.	PAN	-	Al -Namibian Fe - Namibian Cu- IFC
12	HAIB - HM42/2	Non oxidised hanging wall. Low grade material.	Uncertain	Ba	Al -Namibian Fe - Namibian
13	HAIB - HM42/3	Non oxidised zone 1. High grade material.	PAG	Pb, Mo	Al -Namibian Fe - Namibian
14	HAIB - HM42/4	Oxidised hanging wall. Low grade material	PAN	-	Al -Namibian Fe - Namibian
15	Tailings	Composite sample of tailings produced under pilot testing from open circuit cleaner test #4 at a grind of 150 micron.	PAN	Ni	Al -Namibian

6.2 Kinetic Leach Testing

6.2.1 Background

Following the static testing results, the material that will be mined and stored on site required further testing. Samples were selected for kinetic leach testing based on the results from the initial round of ABA and static leach testing interpretation. Based on this, it was proposed that representative samples from each of the sampled material classes are selected for kinetic testing, as well as a duplicate sample sent for QA/QC.

A total of 8 samples were selected and submitted for kinetic testing and included the following:

- High grade material to assess material placed at the ROM pad:
 - Oxidised - HAIB-HM31R
 - Non-oxidised - HAIB-HM12 + HM28/1 + HM42/1 + HM42/3
- Low grade material to assess material stockpiled and sent to the HLP:
 - Oxidised - HAIB HM42/4 (this sample is underweight and we will collect additional material during the site visit the week of 23 June 2025)
 - Non-oxidised - HAIB-HM22/3 + HM33 + HM42/2
- Waste / low grade mixture to assess material to be placed in WRD:
 - Non-oxidised - HAIB-HM22/1 + HM28/2
 - Additional non-oxidised – HAIB-HM22/3
- Tailings to assess material stored at the TSF)
- QA/QC sample - HAIB-HM22/3 Duplicate + HM33 + HM42/2.

6.2.2 Kinetic Leach Testing Results

The selected samples are representative of the various material classes to be onsite. Both oxidised and non-oxidised variants of each waste type (High- and Low-grade ore, Waste Rock and Tailings) were submitted. A duplicate sample for the low-grade oxidised ore was also submitted to the labs.

The kinetic testing of the Haib Copper Mine samples was run for 24 weeks. The results of the different waste stream samples are shown in the graphs below (Figure 6-1 to Figure 6-4).

- Over the 24 weeks of testing, the pH for all the samples has remained stable and neutral with the pH ranging from sub-acidic (6.4) to sub alkaline (8.4) as shown in Figure 6-1. The HGO sample showed an initial pH of 6.5 at the start of the testing (week 0) which increased to 7.5 by week 2. This was followed by a decrease in pH to sub-acidic values (6.6) from week 2 to 6, followed by an increase in pH back to neutral at 7.3 after 8 weeks. The pH then decreases back to 6.5 after 13 weeks. For the following weeks, the pH increases back to neutral 7.6 after 24 weeks.
- The alkalinity of the majority of the samples shows a stable to decreasing trend overall during the 24 weeks, with values ranging from 13 to 70 mg/L. Both the HGO and LGNO samples show a decreasing trend. The tailings material shows an initial increasing trend over 13 weeks, however afterwards the alkalinity has shown a decreasing trend till 24 weeks.
- The sulphate concentrations for all the samples show a stable to slightly decreasing trend over the 24 weeks (Figure 6-3), some of the samples show an increase after 1 week however this increase is likely associated with the flushing of readily soluble constituents (first flush effect). The Tailings sample shows a sharp decrease from 280 mg/L at week 0 to 34 mg/L after 2 weeks and continues to stabilise over the next 22 weeks.

- The calcium (Ca) concentrations for the majority of the samples show a stable trend over the 24 weeks of testing. The tailings sample shows a sharp decrease in Ca concentration for the first 2 weeks and continues to stabilise over the next 22 weeks. Some of samples (HGO, HGNO) show a slight increase in Ca concentrations particularly for the last week.
- The aluminium concentrations for the oxidised and non-oxidised waste, and the non-oxidised low-grade material increase during the first 4 weeks, after which the concentrations decrease. The concentrations range between 0.2 and 0.54 mg/L, and are above the Namibian guideline for excellent drinking water quality of 0.15 mg/L. The aluminium concentrations of the other material comply with the Namibian guideline.
- The Haib samples all show low concentrations for heavy metalloids (As, Cu, Cd, Pb, Zn) with all the samples falling below their respective IFC limits. After 24 weeks most of the heavy metalloid concentrations are extremely low with most of the samples below the detection limits, which indicates that metalloids have a low mobilisation from the Haib material.
- None of the waste stream samples from Haib indicate that acid mine drainage is occurring i.e. none of the samples show a significant decrease in pH, increase in sulphate and decrease in alkalinity/calcium (even though the High-grade Oxidised material did show fluctuating pH trend for the initial 13 weeks of testing). The kinetic testing results show that the Haib mine waste streams are not likely to cause AMD/acid generation, the pH has remained neutral, the sulphate concentrations show a decreasing trend, as well as the heavy metalloids.

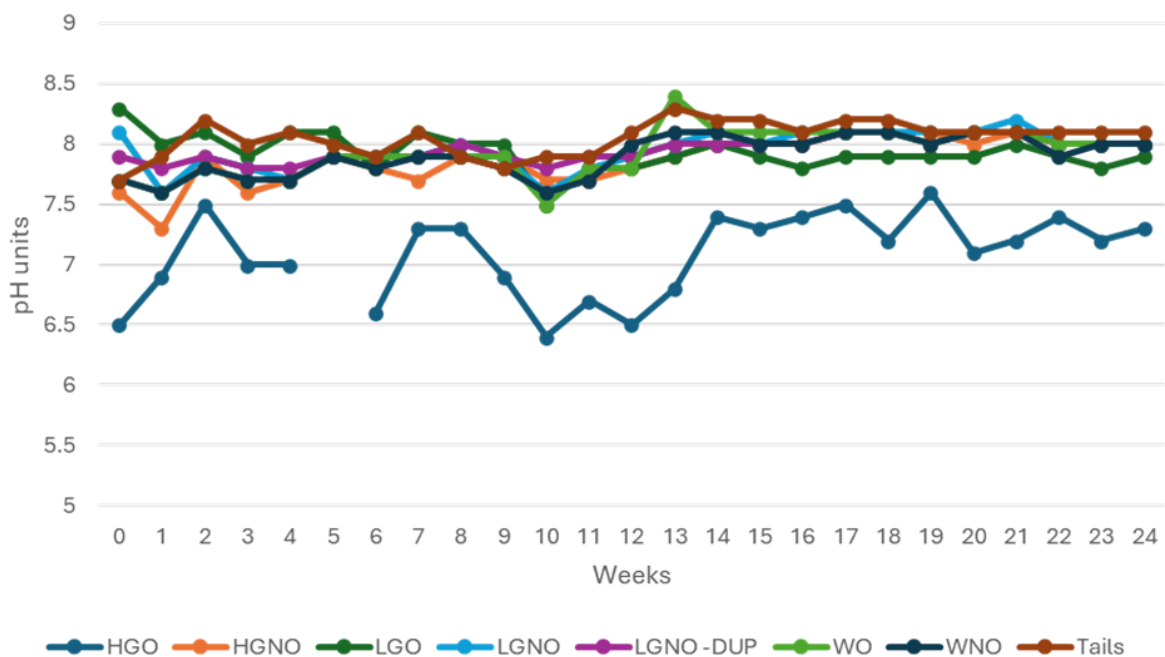


Figure 6-1 : pH values over the 24-week test period

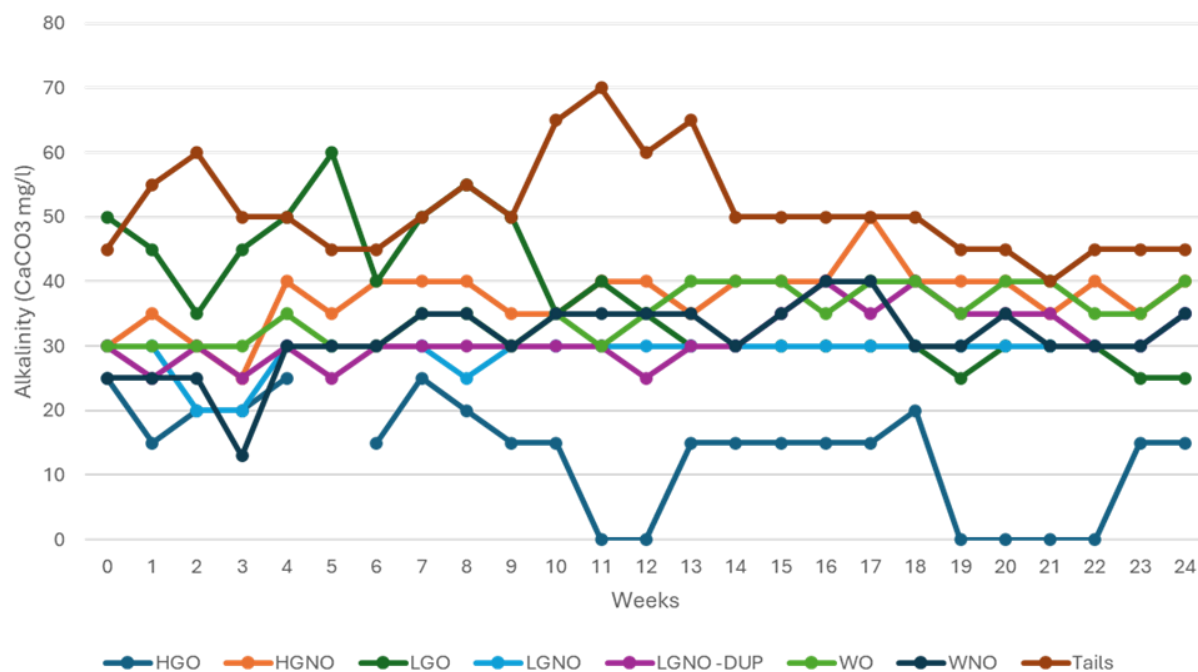


Figure 6-2: Alkalinity concentrations over the 24-week test period

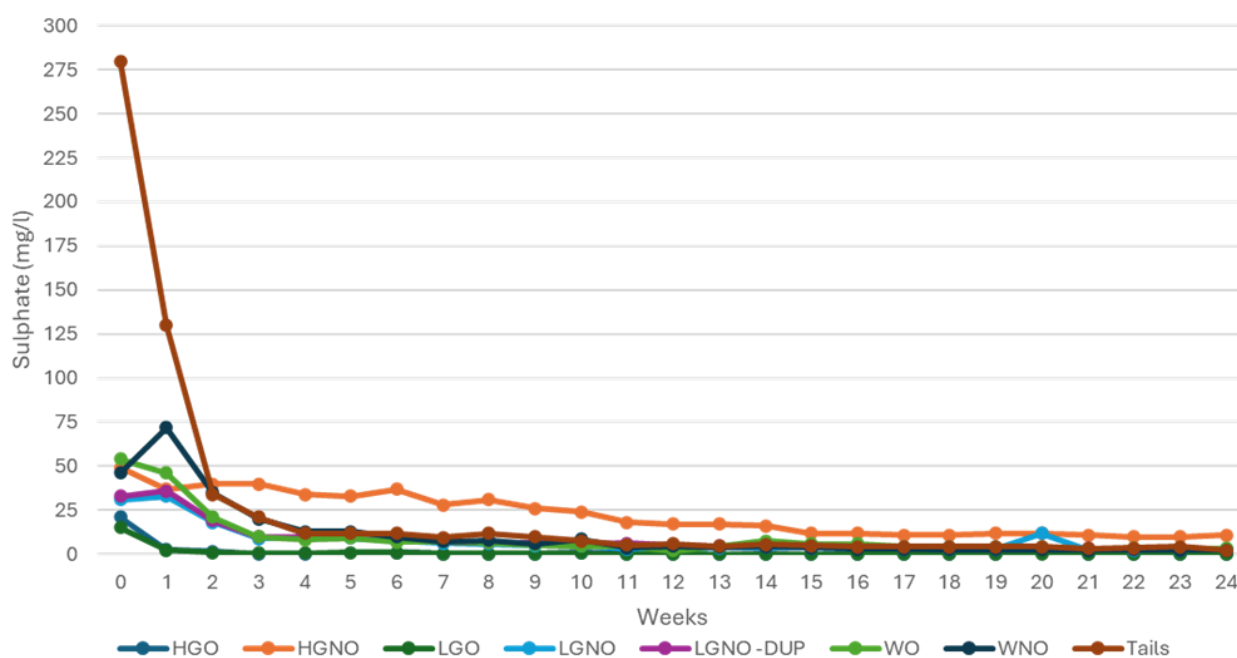


Figure 6-3: Sulphate concentrations over the 24-week test period

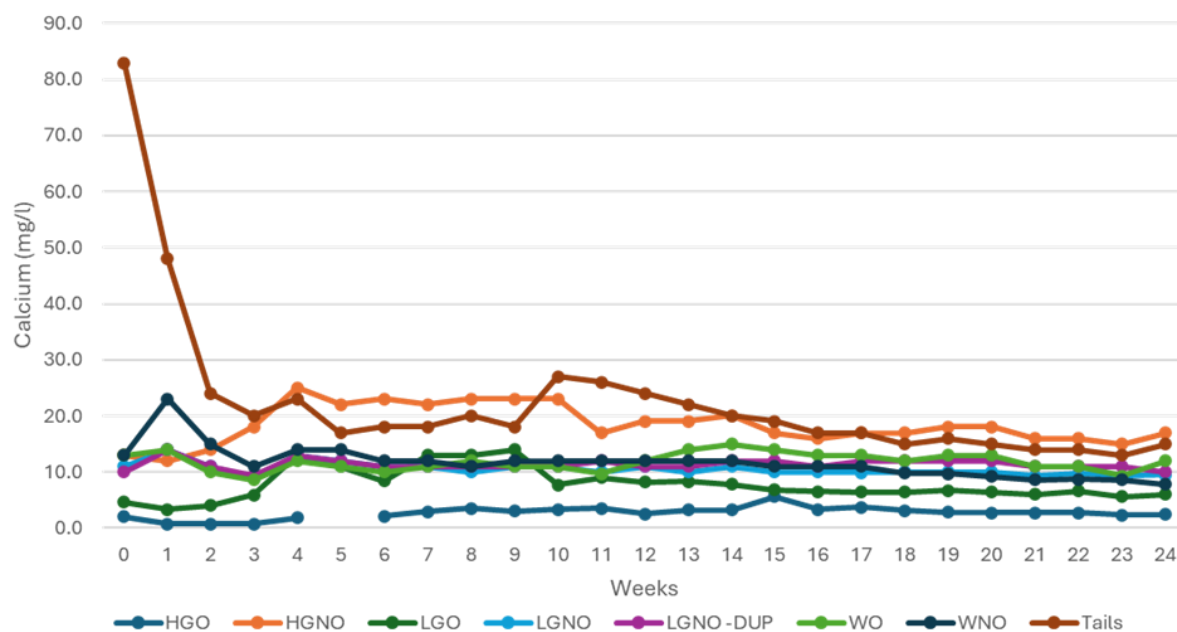


Figure 6-4: Calcium concentrations over the 24-week test period

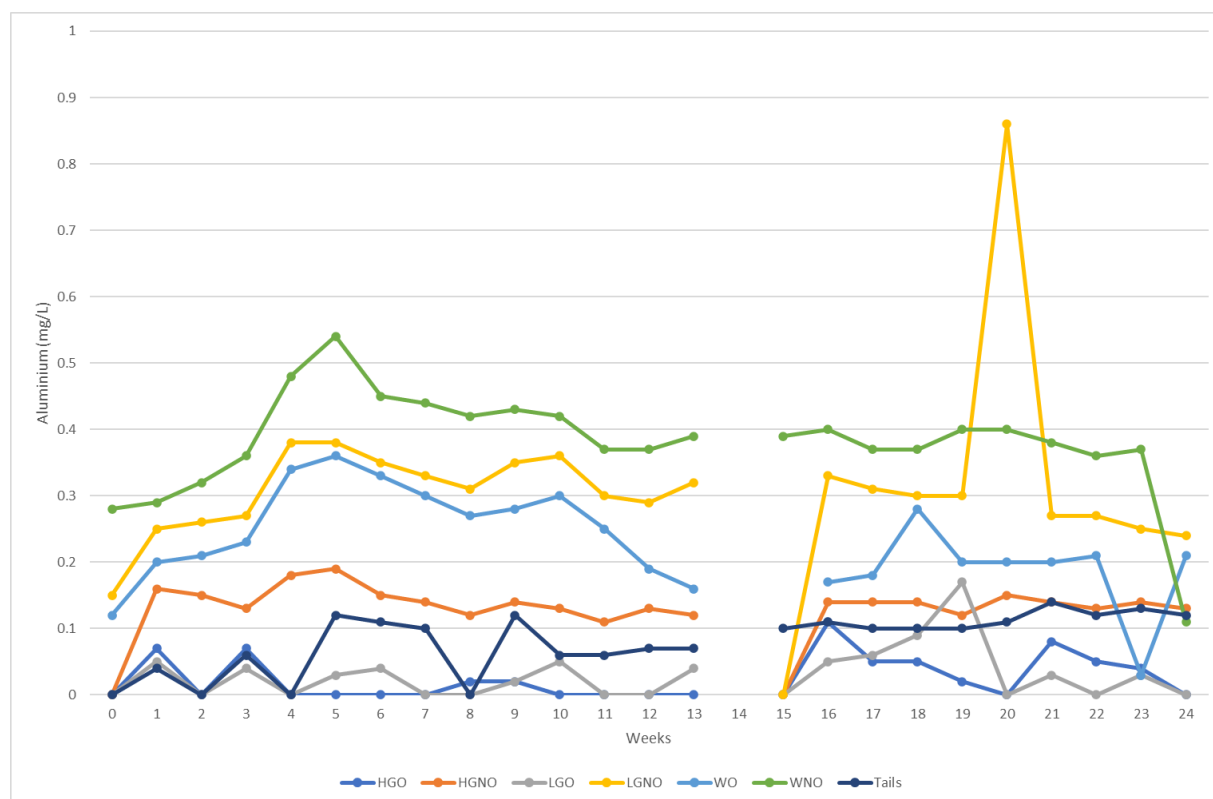


Figure 6-5: Aluminium concentrations over the 24-week test period

6.3 Geochemical Modelling

A geochemical model was developed to calculate the expected element concentrations at the various potential contaminant source areas based on the different lithologies that will be mined, processed, and stored on site.

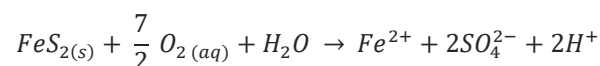
6.3.1 Background

The PHREEQC geochemical modelling software package, designed by (Parkhurst, 1995), has been used to investigate geochemical processes occurring in the aquatic system. PHREEQC is capable of simulating a wide range of mixing of waters and dissolving and precipitating phases to achieve equilibrium with the aqueous phase. The model software is able to consider the irreversible dissolution of solid phases under saturated conditions. The model is also able to use the concept of partial equilibrium to maintain solutes at saturation with respect to secondary phases.

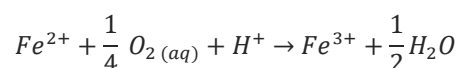
The PHREEQC model uses ion solution concentrations to determine the saturation indices for the soluble solution ions. From these results, PHREEQC is used to determine the potential for any precipitation of secondary minerals and amorphous phases from within the original solution chemistry under any specified environmental conditions. In order to do so, the model balances the chemistry between the secondary, aqueous and gaseous phases taking place by using a series of geochemical reactions.

KP developed a PHREEQC model, that incorporated the humidity cell data to determine whether Acid Mine Drainage will occur for the tailings, high-grade, and low-grade ore, and waste stockpiles and an estimation of time until AMD onset will occur. The models were based on the results from the geochemical analysis results, as well as the material classification that was available at the time (the classification is summarised in Section 6.1 of this document).

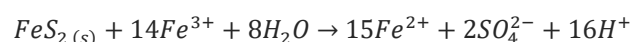
During the operational phase of the Haib Copper Mine, the tailings material, high-grade ore and low-grade ore, and waste stockpile (as defined by Haib Minerals and summarised in Section 6.1 of this document) which contain sulphide bearing minerals, pyrite/pyrrhotite (FeS_2), will be exposed to the Earth's atmosphere (oxidised) and begin to break down according to the reaction below (using pyrite for example):



The reaction above shows that the oxidation of sulphide bearing minerals results in acid production, release of H^+ ions and sulphate (SO_4^{2-}) into solution. In the case of iron sulphide, the ferrous iron released is further oxidised to ferric iron in the presence of oxygen according to:



At pH value <3, ferric iron is released into solution and is made available to oxidise pyrite, although studies have shown that the amount of acid generated as a result of pyrite oxidation by Fe (Lapko, et al., 2006) ⁽²⁰⁰⁶⁾.



The equations above show pyrite oxidation and related processes using pure substances, however pyrite and other minerals in nature always contain impurities. Thus, the above reactions are not expected to occur in nature.

The oxidation of pyrite and subsequent rate of oxidation will impact the neutralisation potential, i.e. dissolution of carbonate and silicate minerals in the tailings and medium grade ore stockpile. The approach followed makes the assumption that ARD is likely to occur due to the nature of the material. Therefore, the laboratory leach test and mineralogy data (XRD) are used to evaluate the rate of sulphide oxidation and determine the time for depletion of the carbonate bearing minerals.

The acidity that is released during the pyrite oxidation process facilitates the chemical weathering of other minerals in the tailings and medium-grade ore stockpile material. The most abundant minerals that are susceptible to chemical weathering are shown to be plagioclase, actinolite, chlorite and talc, with minor mineral constituents including magnetite, ilmenite and biotite based on the XRD analysis results.

Sorption is an important geochemical process involving iron and manganese oxides (magnetite, ilmenite) and hydroxides as well as clay minerals. Sorption refers to the removal of a solute from solution to adhere to an adjacent solid phase. This process is quantitatively modelled in PHREEQC using the surface complexation model (Dzombak & Morel, 1990).

6.3.2 Development of the Haib Kinetic Model

6.3.2.1 Assumptions and Inputs Used

A kinetic model was developed for the Haib Mine material under the scenario:

- The Haib waste material is in an oxic environment with sorption. This scenario will be representative of the onsite conditions, where the rate of sulphide oxidation has been based on kinetic test results of the Haib samples.

The kinetic test results discussed in Section 6.2.2 were used to calculate the sulphide oxidation rate following the method outlined in (Bennett, February 2000). A summary of the calculated sulphide release rates is shown in Table 6-3. From the table it can be seen that the oxidation rate is similar for the different material types that will be mined and stored on site.

Table 6-3: Sulphide oxidation rates calculated from kinetic results

Scenario	Source	Samples	Sulphide Oxidation Rate
			mg/kg/week
Scenario 1	Kinetic test data	Tailings material	6.71E-13
		High & low grade ore stockpile	

6.3.2.2 Methodology

As discussed previously in this report, the static testing done by KP detected elevated dissolved concentrations for Al and Fe for the majority of the Haib samples submitted for the SPLP testing. Based on the static tests these elements were flagged as elements of concern and were included in the geochemical model predictions.

Based on the XRD analysis of the Haib waste samples, only one sample from the high grade and low-grade ore detected pyrite compositions. To better quantify the pyrite concentrations for each waste type at Haib, the sulphide compositions for each sample was used to convert to a percentage of pyrite. The calculation was done using the following equation:

$$\text{Pyrite (FeS}_2\text{)\%} = \text{Sulphide (S)\%} \times \frac{\text{Molecular Weight of FeS}_2}{\text{Atomic weight of S}_2}$$

Once the sulphide oxidation rates were calculated, the kinetic model was calibrated with the available geochemical data (kinetic test results) for the Haib Mine.

The calibrated model was used to calculate the geochemical reactions and resulting leach and water qualities over the life of operations, which is given to be 34 years based on the current mine progression plan. As mentioned previously, the operational phase is divided into a 24-year active mining phase during which the WRD, the high- and low-grade stockpiles, and the TSF will grow continuously. During the final 10 years of operations there will be no more active mining, only processing of stockpiled material. This means that the WRD will remain as is, the high-grade stockpiles will be removed and processed, and the TSF will continue to grow. Please note that at the time of this report there was no indication as to if, and when, the low-grade ore stockpile will be processed.

The model was then used to calculate the geochemical development during the post-closure phase. The chemical reactions within the TSF and waste rock dump was calculate for a period up to 100 years post-closure (thus 134 years in total together with the operational phase). It was assumed that the high-grade stockpile was completely removed by the end of the operational phase. As a worst-case scenario it was assumed that the low-grade stockpile will not be processed, and thus will remain to the west of the pit.

6.3.2.3 Model Setup

The model input parameters for PHREEQC can be classified into 3 phases, each phase is subsequently detailed below.

Gas Phase

The gas phase for the PHREEQC model is representative of the Earths atmosphere. Oxygen and carbon dioxide are reactive gases and most likely to take part in geochemical reactions in the tailings and ores stockpile material. The atmosphere contains 21% oxygen, the oxygen fugacity was set to 0.21 in the model. The current carbon dioxide concentration is approximately 420 ppmv, which was set in the gas phase of model.

Liquid Phase

The liquid phase of the model is water, the focus of the model is to determine the impact of the leachate in terms of AMD. The initial water is set at neutral pH of 7, with no dissolved ions and a default redox potential of 237 mv, which represents oxic conditions.

Solid Phase

The Haib samples contained various compositions of silicate, sulphate and carbonate bearing minerals in the tailings and ore sample. The mineral compositions of the tailings and medium grade ore stockpile samples, as determined by XRD analysis, were used as input to the model and shown in Table 6-4.

There are two types of solid phases added to the model, those that react rapidly enough that equilibrium or close to equilibrium is achieved within the timeframe of model are referred to as equilibrium phase. The second type of solid phase are those minerals and elements that react slowly and thus need to be described kinetically by a rate law, and are referred to as kinetic phase.

The minerals described kinetically in the model include pyrite and the silicates. Pyrite was modelled using the rate law equation from (Williamson & Rimstidt, 1994):

$$r = k \frac{[O_2(aq)]^{0.5}}{[H^+]^{0.11}}$$

Where k is kinetic rate constant, which was obtained from humidity cell data (kinetic tests) of the Haib samples. The square brackets indicate molar concentrations, O_2 is dissolved oxygen and H^+ refers to hydrogen ion in solution (related to pH).

The silicate minerals were modelled using the rate law equation:

$$r = k[H^+]^n$$

Where k is the rate constant derived from derived from (Brantley, et al., 2008), the square brackets indicate molar concentrations and n is an exponent which refers to the dissolution of a specific mineral to its sensitivity of the solutions pH (Palandri & Kharaka, 2004).

Table 6-4: Minerals composition and input to PHREEQC

Mineral Name	Formula	Model Phase input
Quartz	SiO_2	Kinetic
Microcline	$KAlSi_3O_8$	Kinetic
Plagioclase	$NaCaAlSi_3O_8$	Kinetic
Muscovite	$KAl_2(Si_3Al)O_{10}(OH,F)_2$	Kinetic
Pyrite	FeS_2	Kinetic
Dolomite	$CaMg(CO_3)_2$	Equilibrium
Calcite	$CaCO_3$	Equilibrium

6.3.3 Model Results – Operational Phase

6.3.3.1 High-Grade Ore

The high-grade ore will be stored temporarily on the run-of-mine ore stockpile before being processed in the plant. The material turnover will be rapid, with little time for geochemical reactions taking place and leachate developing before the material is processed and replaced with new mined material. However, the ore stockpile area will be unlined, and it is possible that some contamination can enter the underlying soil and eventually aquifers in the footprint of the ore stockpiles. Results from the geochemical modelling show:

- **pH:** The pH of the high-grade ore during this simulation shows an overall decreasing trend, with the pH ranging between sub-alkaline values of 8.5 to 8.18 (please refer to Figure 6-6). For this operational phase simulation, the pH shows a steady decrease over the 34 years, with the pH stabilising around 8.2 after 28 years. Although the simulated pH values (8.18) are slightly more alkaline than kinetic results for the high-grade ore samples (7.8), they are still comparable.
- **Carbonate minerals (calcite and dolomite):** The carbonate bearing minerals (Calcite and Dolomite), both show a gradual decrease in concentrations over the 34 years (Figure 6-6). The calcite concentrations drop slowly from 109.7 to 108 mg/L while the dolomite concentrations remain virtually constant with only a very slight decrease from 18.4 to 18.1 mg/L over the life of operations (34 years). The slight decrease in dolomite and calcite indicates that the high-grade ore will have sufficient buffering capacity as the carbonate bearing minerals are not depleted during the 34 years.
- **Iron and Aluminium:** The Fe concentrations show a decreasing trend during the 34-year period, while the Al concentrations show an increasing trend. The Al concentrations rise rapidly

for the initial 3 years from near 0 mg/L, reaching 0.09 mg/L, followed by a slower increasing trend ending at 0.29 mg/L at the end of life of operations. Although the Al shows an increasing trend, the concentrations are relatively low and are comparable to the kinetic leach test results which showed an average Al concentration of 0.11 mg/L. While the Fe concentrations were extremely low in the model (9.9E-8 mg/L), this is similar to the kinetic results which showed the Fe concentrations were below detection limit (BDL).

- **Sulphate:** The sulphate concentration is calculated to increase from near 0 mg/L to around 218 mg/L during the operational phase of the mine (34 years). The sulphate originates from the pyrites as seen from the XRD analysis results.
- **General overview of the chemical development:** The operational phase simulation shows that the leachate from the high-grade ore will remain sub-alkaline in pH with low sulphate (<250 mg/L), aluminium (<1 mg/L) and iron (<0.1 mg/L) concentrations over the life of the operations, which is consistent with kinetic leach test data. The model shows that in an oxic environment the pyrite will oxidise to sulphate and release H⁺ ions. However, the carbonate content remains stable during the operational phase simulation and does not deplete and will provide enough buffer to any acid generated from the high-grade ore. The sulphate concentrations are not considered high and the pH remains sub-alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and the high-grade ore provides a low risk for acid mine generation.

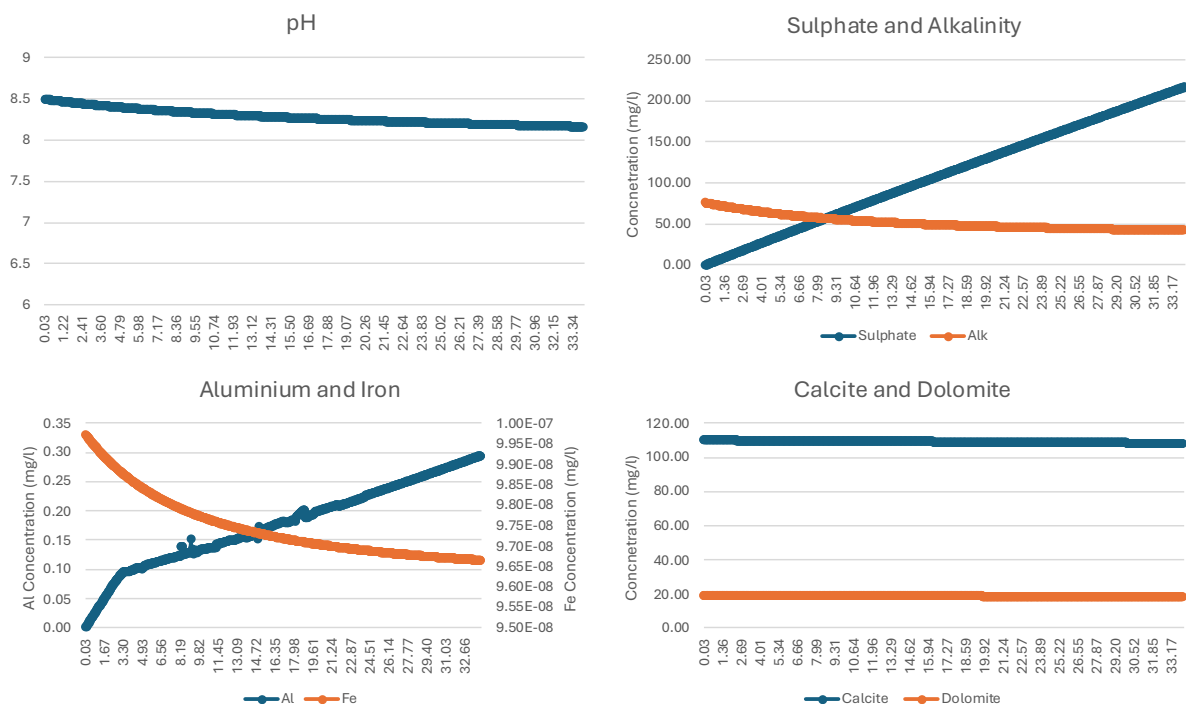


Figure 6-6: Results of the operational phase simulation for the high-grade ore.

ALL CONCENTRATIONS ARE PROVIDED IN MG/L

6.3.3.2 Low-Grade Ore

The low-grade ore will be stored in a stockpile to the west of the pit. It is not currently known whether the low-grade material will be processed. As a worst-case approach, it is assumed that the material will not be processed, and will remain stockpiled for the entire duration of the life of mine (34 years). Results from the geochemical modelling show:

- **pH:** The pH of the low-grade ore during this simulation shows an overall decreasing trend, with the pH ranging between sub-alkaline values of 8.5 to 8.17 (please refer to Figure 6-6). For this operational phase simulation, the pH shows a steady decrease over the 34 years, with the pH stabilising around 8.2 after 28 years.
- **Carbonate minerals (calcite and dolomite):** The carbonate bearing minerals (Calcite and Dolomite), both show a gradual decrease in concentrations over the 34 years (Figure 6-6). The calcite concentrations drop slowly from 99.75 to 97.96 mg/L while the dolomite concentrations remain virtually constant with only a very slight decrease from 50.02 to 49.93 mg/L over the life of operations (34 years). The slight decrease in dolomite and calcite indicates that the high-grade ore will have sufficient buffering capacity as the carbonate bearing minerals are not depleted during the 34 years.
- **Iron and Aluminium:** The Fe concentrations show a decreasing trend during the 34-year period, while the Al concentrations show an increasing trend. The Al concentrations rise rapidly for the initial 3 years from near 0 mg/L, reaching 0.09 mg/L, followed by a slower increasing trend ending at 0.29 mg/L at the end of life of operations. Although the Al shows an increasing trend, the concentrations are relatively low and are comparable to the kinetic leach test results. While the Fe concentrations were extremely low in the model (9.9E-8 mg/L), this is similar to the kinetic results which showed the Fe concentrations were below detection limit (BDL).
- **Sulphate:** The sulphate concentration is calculated to increase from near 0 mg/L to around 220 mg/L during the operational phase of the mine (34 years). The sulphate originates from the pyrites as seen from the XRD analysis results.
- **General overview of the chemical development:** The operational phase simulation shows that the leachate from the low-grade ore will remain sub-alkaline in pH with low sulphate (<250 mg/L), aluminium (<1 mg/L) and iron (<0.1 mg/L) concentrations over the life of the operations, which is consistent with kinetic leach test data. The model shows that in an oxic environment the pyrite will oxidise to sulphate and release H⁺ ions. The sulphate concentrations are not considered high and the pH remains sub-alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and the high-grade ore provides a low risk for acid mine generation.

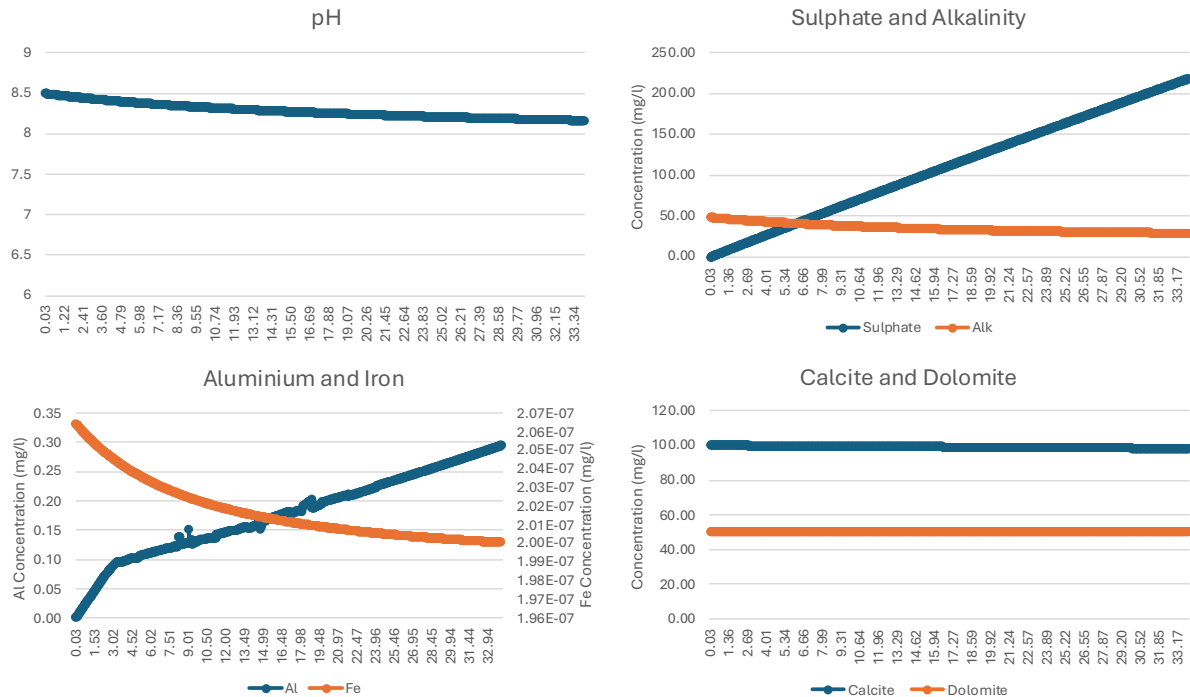


Figure 6-7: Results of the operational phase simulation for the low-grade ore.

6.3.3.3 Waste Material

The waste material will be stored on the waste rock dump to the east of the pit. Rainfall onto the WRD will infiltrate the waste rock material and leach elements from the material. This enriched leachate will then enter the underlying aquifers, particularly the alluvial aquifer that forms the bottom of the valley within which the WRD will be located. The results for the waste material are discussed below and shown graphically in Figure 6-8. This simulation was run for 34 years to represent the operational phase of the mine. Note that as described previously in this report, deposition of waste material on the WRD will stop after year 24 of the LoM due to active mining stopping in year 24. However, geochemical reactions will continue up the end of the operational phase at year 24.

- pH:** The pH of the waste rock during this simulation shows a slightly decreasing trend, with the pH ranging sub-alkaline values from 8.5 to 8.2. The waste material simulation has comparable pH values (8.2) to those recorded in the kinetic tests for the (8.0).
- Carbonate minerals (calcite and dolomite):** The carbonate bearing minerals (calcite) for this simulation show a stable to slight gradual decrease in concentrations over the life of operations. Note that there was no dolomite recorded from the XRD analysis, therefore, dolomite is not included here. The calcite concentrations drop slowly from 43.67 to 42.28 mg/L. The steady decrease in calcite indicates that the waste material will have sufficient buffering capacity as the carbonate bearing minerals are not depleted during the life of operations.
- Iron and Aluminium:** The Fe and Al concentrations for this simulation show overall low concentrations during the 34 years. The Fe concentrations show a decreasing trend during the 34-year period, while the Al concentrations show an increasing trend. Similar to the other material, the Al concentrations rise rapidly for the initial 3 years reaching 0.091 mg/L, followed by a slower increase to reach 0.29 mg/L at the end of life of operations. Although the Al shows

an increasing trend, the concentrations are low (<1 mg/L) and are comparable with the kinetic test results which showed an average Al concentration of 0.21 mg/L. The Fe concentrations are extremely low in the model ($9.8\text{E-}8$ mg/L), which is similar to the kinetic results which showed the Fe concentrations were below detection limit (BDL).

- General overview of the chemical development:** The operational phase simulation shows that the leachate from the waste material will remain sub-alkaline in pH with low aluminium (<1 mg/L) and iron (<0.1 mg/L) concentrations during the life of operations. The simulated results are consistent with kinetic test data for the waste material. The model shows that in the oxic environment the pyrite will oxidise to sulphate and release H^+ ions. However, the carbonate content remains stable during the operational phase simulation and does not deplete and will provide enough buffer to any acid generated from the material. The sulphate concentrations are low and the pH remains sub-alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and material provides a low risk for acid mine drainage generation.

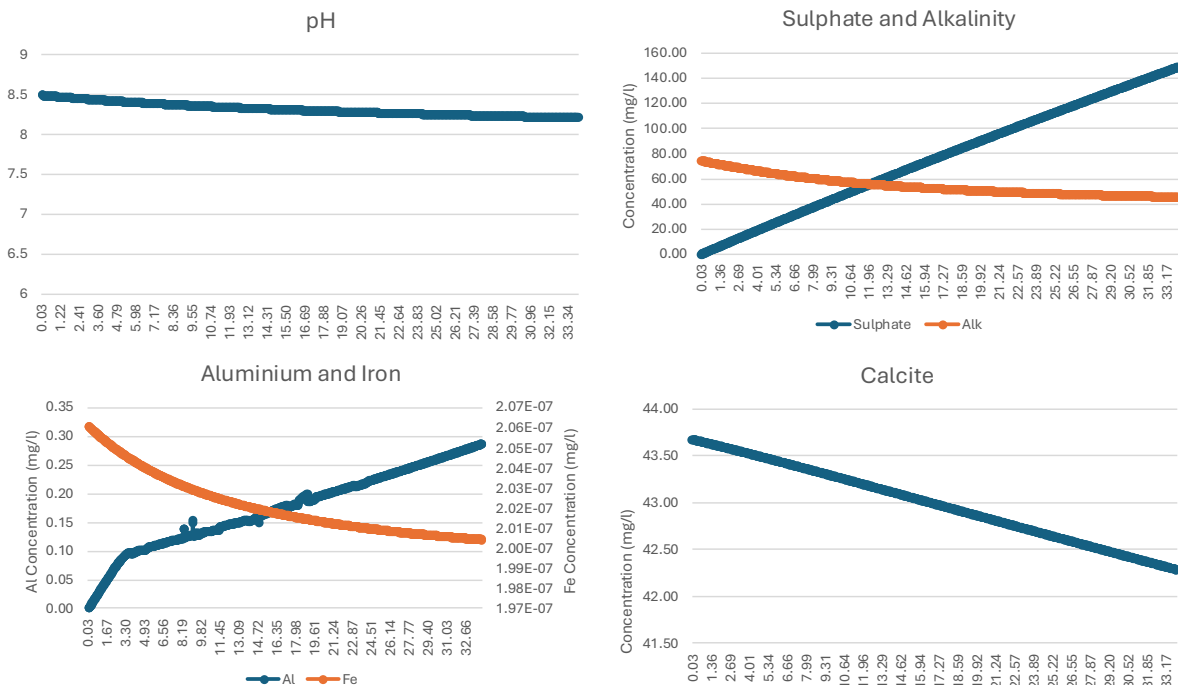


Figure 6-8: Results of the operational phase simulation for the waste material.

ALL CONCENTRATIONS ARE PROVIDED IN MG/L

6.3.3.4 Tailings

The results for the tailings material are discussed below and shown graphically in Figure 6-9. Water and leach qualities at the TSF were simulated as part of a semi-closed system with water recycled from the TSF back to the plant. This could lead to increase in element concentrations over time. Better quality make-up water will dilute the element increase. The make-up water volume is not known at present, and a worst-case scenario with no make-up water dilution was simulated. This simulation was run for 34 years to represent the operational phase of the mine. Active tailings deposition is scheduled for 33 years of the operational phase, but geochemical reactions will still take place during the final year of operations.

- **pH:** The pH of the tailings shows an overall decreasing trend, with the pH ranging sub-alkaline values of 8.5 to 8.20. The pH shows a steady decrease over the 34 years. The simulated pH results are highly comparable to the kinetic test data for the Haib tailings sample which recorded an average pH of 8.1.
- **Sulphate:** The sulphate concentrations are expected to increase over time operations due to continued circulation of the water between the plant and the TSF. The model results show a gradual increase, reaching 156 mg/L at the end of the operational phase. The continued increasing trend until the end of life of operations indicates that the geochemical conditions and reactions have not reached equilibrium yet with regards to gypsum. Once equilibrium is reached gypsum will become supersaturated and precipitate out of solution causing the sulphate release to cease as the formation of gypsum will begin to absorb the sulphate. The calculated sulphate concentrations fall below the drinking water standards limits of 250 mg/L.
- **Alkalinity:** The alkalinity shows a gradually decreasing trend, with concentrations decreasing from 74.65 to 60.91 mg/L over the 34 years life of operations. As the alkalinity does not deplete, the pH will remain stable and not fall below alkaline values indicating low potential for acid mine drainage.
- **Carbonate minerals (calcite and dolomite):** For the tailings sample only calcite is present as a carbonate bearing mineral, no dolomite was found in the XRD analysis. The simulated results show a gradual decrease in concentration, where the calcite concentrations drop gradually from 55.6 to 54.2 mg/L over the 34 years. The steady decrease in calcite indicates that the tailings material will have sufficient buffering capacity as the carbonate bearing minerals are not depleted after the 34 years. Note that the XRD analysis showed that dolomite is not present in the tailings material.
- **Iron and Aluminium:** Similar to the sulphate concentrations, the aluminium concentrations could increase over time due to circulation of the water between the plant and the TSF. As noted with high-grade ore and waste material, the Fe concentrations show a decreasing trend during the 34-year period, while the Al concentrations show an increasing trend. The Al concentrations increase to around 1.30 mg/L in year 20 of the operations, after which the concentrations show a stabilising trend at approximately 1.30 to 1.35 mg/L.
- **General overview of the chemical development:** The operational phase simulation shows that the leachate from the tailings material will remain sub-alkaline in pH with low sulphate (<250 mg/L), aluminium (<1.4 mg/L) and iron (<0.1 mg/L) concentrations over the 34 years. The simulated results are consistent with kinetic test data. The model shows that in the oxic environment the pyrite will oxidise to sulphate and release H⁺ ions. However, the carbonate content remains stable during the operational phase simulation and does not deplete and will provide enough buffer to any acid generated from the tailings material. The sulphate concentrations are not considered high and the pH remains sub-alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and the tailings material provides a low risk for acid mine generation.

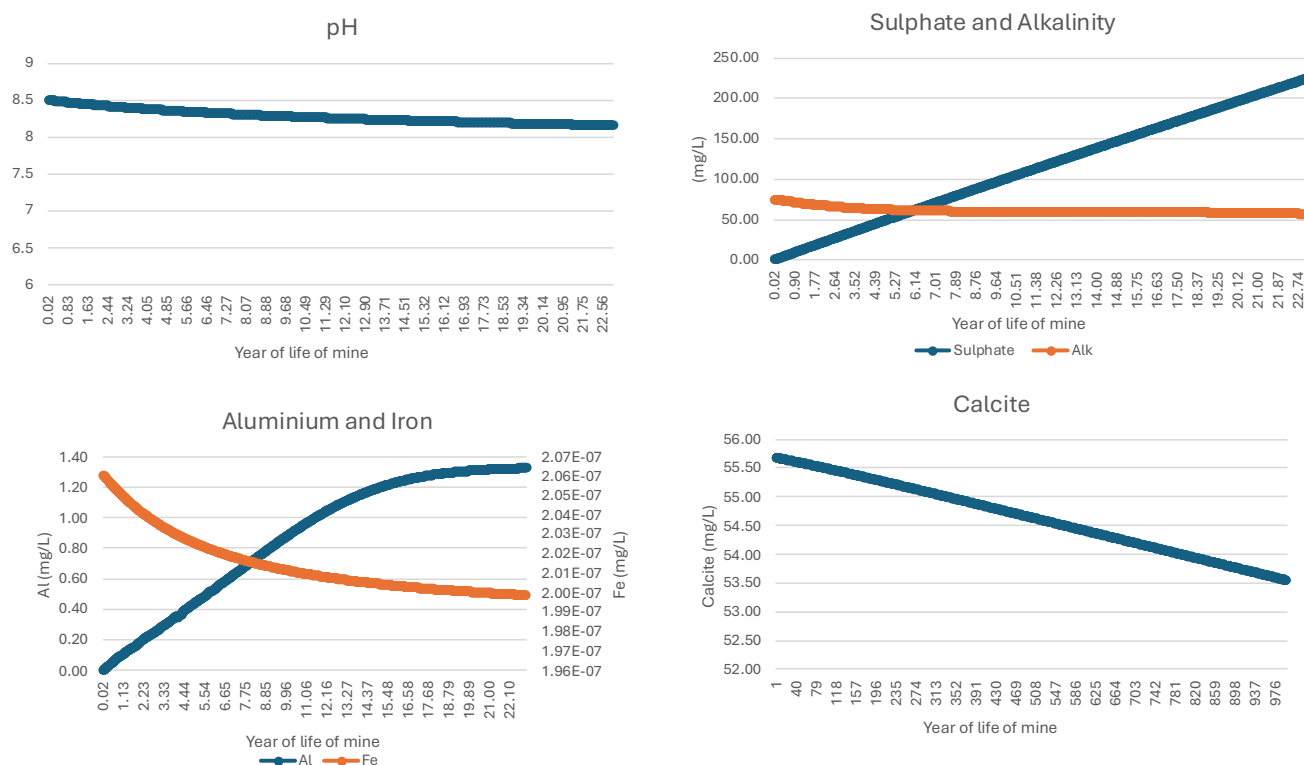


Figure 6-9: Results of the operational phase simulation for the tailings material.

ALL CONCENTRATIONS ARE PROVIDED IN MG/L

6.3.4 Model Results - Post Operational phase – Tailings material

6.3.4.1 High-Grade Ore

High-grade ore will not be handled or stored in the post-operational phase. The footprints of the run-of-mine stockpiles where the high-grade ore was temporarily stored during the operational phase are expected to be rehabilitated and no risks or impacts from the high-grade ore is expected during the post-closure phase.

6.3.4.2 Low-grade Ore

The stockpiling of low-grade ore to the west of the pit is strategic in line with the optional processing by heap leaching which will be revisited during the LoM depending on economic drivers and feasibility of processing. The timing of processing of the material is currently unclear and towards effectively managing potential impacts, the worst-case scenario has been adopted in this report, which includes the assumed permanent "stockpiling" of low-grade ore or treating the material as waste. As a result, it is assumed that the low-grade stockpile will remain permanently, and therefore the geochemistry is assessed for the standard period of 100 years post-closure.

- **pH:** The pH of the low-grade material shows an overall decreasing trend, with the pH ranging sub-alkaline to alkaline values of 8.2 to 8.12. The pH shows a gradual decrease over the 100 years. The simulated pH results are highly comparable to the kinetic test data for the Haib tailings sample which recorded an average pH of 8.1.
- **Sulphate:** The sulphate concentrations show a gradual increase in the time up to 100 years post-closure when it is expected to reach approximately 315 mg/L, which slightly exceeds the

Namibian water quality standard of 300 mg/L. The increasing trend indicates that the model has not reached equilibrium yet with regards to gypsum after 100 years, once it has gypsum will become supersaturated and precipitate out, which will cause the sulphate release to cease as the formation of gypsum will begin to absorb the sulphate.

- **Alkalinity:** The alkalinity initially shows a steady increasing trend from 43 mg/L at the start of the post-closure phase, to 49 mg/L at 100 years post-closure. As the alkalinity does not deplete fully, the pH will remain stable and not fall below alkaline values indicating low potential for acid mine drainage.
- **Carbonate minerals (calcite and dolomite):** For the post-operational phase tailings, calcite shows a gradual decrease in concentration, where the calcite concentrations drop gradually from 100.53 to 99.6 mg/L over the 100 years. The gradual decrease in calcite indicates that the tailings material will have sufficient buffering capacity as the carbonate bearing minerals are not fully depleted after the 100 years. Dolomite remains steady at 92 mg/L.
- **Iron and Aluminium:** The iron concentrations are overall low (2.0E-7 mg/L), which reflects the kinetic results which showed the Fe concentrations were below detection limit (BDL). The Al concentrations increase to just below 1 mg/L during the 100 years.
- **General overview of the chemical development:** The post operational phase simulation shows that the leachate from the tailings material will remain alkaline in pH with slightly elevated sulphate and aluminium concentrations while the iron concentrations remain low (2.0E-7 mg/L). The model shows that in the oxic environment the pyrite will oxidise to sulphate and release H⁺ ions. However, the carbonate content remains stable during the operational phase simulation and does not deplete and will provide enough buffer to any acid generated from the tailings material. Although the sulphate concentrations increase, the pH remains alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and the tailings material provides a low risk for acid mine generation.

6.3.4.3 Waste Material

The waste rock dump to the east of the pit will remain in the post-operational phase. No new material will be deposited on the WRD after year 24 of the life of mine when active mining stops, and the element concentrations in leachate emanating from the WRD will reduce over time as it is leached from the rock material. Rainfall recharge will be sporadic, and it is not expected that significant seepage volumes will be significant. For the discussion in this section the geochemistry of the waste material is discussed from the start of the post-closure phase (year 34) onwards. The geochemistry between years 24 and 34 are discussed in Section 6.3.3 (operational phase).

- **pH:** The pH of the tailings during this simulation shows an overall decreasing trend, with the pH ranging sub-alkaline to alkaline values of 8.35 to 8.22. The pH shows a gradual decrease over the 100 years. The simulated pH results are highly comparable to the kinetic test data.
- **Sulphate:** The sulphate concentrations show a gradual increase in the time up to 100 years post-closure when it is expected to reach approximately 250 mg/L, which complies with the Namibian water quality standard of 300 mg/L. The increasing trend indicates that the model has not reached equilibrium yet with regards to gypsum after 100 years, once it has gypsum will become supersaturated and precipitate out, which will cause the sulphate release to cease as the formation of gypsum will begin to absorb the sulphate. The model shows that after 100 years the sulphate concentrations will still comply with the Namibian water quality standard.
- **Alkalinity:** The alkalinity initially shows a slight decreasing trend from 60.5 mg/L at the start of the post-closure phase, to 55.9 mg/L at 100 years post-closure. As the alkalinity does not

deplete fully, the pH will remain stable and not fall below alkaline values indicating low potential for acid mine drainage.

- **Carbonate minerals (calcite and dolomite):** For the post-operational phase tailings, only calcite is present as a carbonate bearing mineral. The simulated results show a gradual decrease in concentration, where the calcite concentrations drop gradually from 44.2 to 43.2 mg/L over the 100 years. The gradual decrease in calcite indicates that the tailings material will have sufficient buffering capacity as the carbonate bearing minerals are not fully depleted after the 100 years.
- **Iron and Aluminium:** The iron concentrations are overall low ($2.01\text{E-}7$ mg/L), which reflects the kinetic results which showed the Fe concentrations were below detection limit (BDL). The Al concentrations increase to 0.9 mg/L at 100 years post-closure.
- **General overview of the chemical development:** The post operational phase simulation shows that the leachate from the tailings material will remain alkaline in pH with slightly elevated sulphate and aluminium concentrations (which still comply with Namibian drinking water guidelines) while the iron concentrations remain low ($2.01\text{E-}7$ mg/L). The model shows that in the oxic environment the pyrite will oxidise to sulphate and release H^+ ions. However, the carbonate content remains stable during the operational phase simulation and does not deplete and will provide enough buffer to any acid generated from the tailings material. Although the sulphate concentrations increase, the pH remains alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and the tailings material provides a low risk for acid mine generation.

6.3.4.4 Tailings

The TSF will remain in the post-operational phase, but no new material will be deposited after processing stopped in year 33 of the life of mine. The element concentrations in leachate emanating from the TSF are expected to change over time. The closure plan, including whether sloping and capping, which will influence the availability of air for oxidation of the material, and rainfall recharge to drive leachate migration, will be done, will influence the final element concentrations.

As a worst-case scenario, an oxidative environment, where oxidation of the tailings material is expected, was simulated. Based on the results from the laboratory testing only calcite will be present as a carbonate bearing mineral. The simulated results show a gradual decrease in calcite concentration, gradually dropping from 56.3 to 54.76 mg/L over 100 years post-closure.

Due to the decreasing calcite concentrations, the buffering capacity of the tailings material will be depleted over time. This will lead to a slight lowering of the pH from 8.2 to 8.12 at 50 years post-closure. The slightly decreasing pH will cause a slight increase in the metals concentrations in leachate emanating from the TSF.

- **pH:** The pH of the tailings during this simulation shows an overall decreasing trend, with the pH ranging sub-alkaline to alkaline values of 8.2 to 8.12. The pH shows a gradual decrease over the 100 years. The simulated pH results are highly comparable to the kinetic test data for the Haib tailings sample which recorded an average pH of 8.1.
- **Sulphate:** The sulphate concentrations show a gradual increase in the time up to 100 years post-closure when it is expected to reach approximately 310 mg/L, which slightly exceeds the Namibian water quality standard of 300 mg/L. The increasing trend indicates that the model has not reached equilibrium yet with regards to gypsum after 100 years, once it has gypsum will become supersaturated and precipitate out, which will cause the sulphate release to cease as the formation of gypsum will begin to absorb the sulphate.

- **Alkalinity:** The alkalinity initially shows a slight increasing trend from 64 at the start of the post-closure phase, to 72 mg/L at year 13 of the post-closure phase (year 47 overall), followed by a gradually decreasing trend, with concentrations decreasing from to 71.6 mg/L at 100 years post-closure. As the alkalinity does not deplete fully, the pH will remain stable and not fall below alkaline values indicating low potential for acid mine drainage.
- **Carbonate minerals (calcite and dolomite):** For the post-operational phase tailings, only calcite is present as a carbonate bearing mineral. The simulated results show a gradual decrease in concentration, where the calcite concentrations drop gradually from 56.3 to 54.7 mg/L over the 100 years. The gradual decrease in calcite indicates that the tailings material will have sufficient buffering capacity as the carbonate bearing minerals are not fully depleted after the 100 years.
- **Iron and Aluminium:** The iron concentrations are overall low ($2.0\text{E-}7$ mg/L), which reflects the kinetic results which showed the Fe concentrations were below detection limit (BDL). The Al concentrations are elevated (>1 mg/L) during the 100 years and show an increasing trend to 2.43 mg/L during the first 21 years, after which a gradual increase is observed with a final Al concentration of 2.5 mg/L after 100 years.
- **General overview of the chemical development:** The post operational phase simulation shows that the leachate from the tailings material will remain alkaline in pH with slightly elevated sulphate and aluminium concentrations (>1 mg/L) while the iron concentrations remain low ($2.0\text{E-}7$ mg/L). The model shows that in the oxic environment the pyrite will oxidise to sulphate and release H^+ ions. However, the carbonate content remains stable during the operational phase simulation and does not deplete and will provide enough buffer to any acid generated from the tailings material. Although the sulphate concentrations increase, the pH remains alkaline, which indicates that the carbonate and silicate minerals will provide enough buffer capacity so that the leachate will not be acidic and the tailings material provides a low risk for acid mine generation.

7.0 IMPACT ASSESSMENT

The impact assessment was conducted using the numerical groundwater flow and contaminant migration models that were developed. Impacts to the groundwater resource, and down-gradient receptors, could include:

- Impacts on groundwater flow volumes:
 - Reduction in groundwater levels and volumes present in the mine due to mine dewatering. This can subsequently reduce the volume of water present in the surface water bodies due to reduced baseflow contribution, and/or direct drawing of water from the stream towards the pit.
 - Artificially increased recharge in areas underlying the TSF, WRD, low-grade stockpile, and heap leach pad. This can lead to localised mounding of groundwater levels, and the associated development of groundwater flow patterns radially away from the surface infrastructure footprints. With the WRD located within river channels, it can also lead to increased flows in the alluvial aquifer. The northern portion of the TSF is located in a relatively flat, sand covered area, while the southern portion covers a more topographically complex area with outcropping fractured rock. Seepage from the TSF can be expected to drain into the river alluvials east of the TSF.
 - Seepage from the off-channel water storage dam will recharge into the underlying alluvial aquifer, and the exposed fractured rock on the walls of the valley within which the dam will be located. Current understanding of the construction of the dam wall is that all the sand and softs will be excavated until competent rock is reached. Seepage under the dam will depend on the rock weathering and fractures/joints. For the sake of this assessment, it is assumed that there can be seepage through the alluvials, as well as the upper fractured rock zone, to the downgradient side of the dam wall.
- Impacts on groundwater qualities:
 - Contaminant migration away from the potential pollution sources (TSF, WRD, low-grade stockpile, heap leach pad, pit) can impact the groundwater qualities, and potentially the surface water qualities in areas where poor quality groundwater enters the surface water in the form of baseflow contribution.
 - Water stored within the off-channel water storage dam will be pumped from the Orange River. Monitoring data shows that the quality of the water that will be stored in the dam will be of much better quality than the natural groundwater quality in the fractured rock aquifer and the alluvials. Therefore, seepage from the dam can improve the groundwater quality in the aquifers around the dam.

7.1 Impacts on Groundwater Quantities

Impacts from the proposed mining activities can lead to both an increase and a decrease in groundwater volumes present in the underlying and surrounding aquifers.

Groundwater volumes can be increased by:

- Rainfall recharging into the waste rock stockpile and the low-grade ore stockpile which will artificially increase the recharge over the footprint on the WRD.
- Wet deposition of tailings material onto an unlined facility can artificially increase recharge to the underlying aquifers. This will create a mounding of the groundwater levels underneath the facilities and can lead to changed groundwater flow patterns and velocities.

- Water pumped from the Orange River for water supply to the operations will be stored in the off-channel water storage dam. The dam will be operated with a water level of 350 mamsl. Seepage from the dam will recharge the underlying aquifers.

Groundwater volumes can be decreased by reduced recharge, and active dewatering.

- As per design, the heap leach area will be lined, therefore, it is assumed that under ideal conditions there will be a reduction in seepage and recharge into the underlying aquifers within the footprint of the heap leach pad.
- The groundwater volume will also be reduced due to mine dewatering. Once the mine pit breaches the groundwater level in the mine groundwater inflows will start. Mine dewatering will commence to ensure a safe working environment. This mine dewatering will reduce the volume of groundwater available in the surrounding aquifers, and lead to a drawdown in the groundwater levels. It will also lead to changes in the groundwater flow patterns with groundwater flow, within the zone of influence of the groundwater level drawdown cone, now being re-directed towards the mining area.

Groundwater abstraction for water supply and pit dewatering may cause drawdown, potentially impacting surrounding water users or ecosystems dependent on groundwater. These risks are particularly important in the arid setting where water is scarce and highly valued. It should be noted that it is currently planned that water will be sourced from the Orange River via NamWater, and therefore, it is not expected that there will be an impact on the groundwater quantity due to water supply needs.

7.1.1 Construction Phase

Mining activities during the construction phase that could impact the groundwater resource will entail:

- Construction of the surface infrastructure (TSF, WRD, low-grade ore stockpile, heap leach pad, etc.).
- Preparation of the pit area.
- Construction of the off-channel water storage dam.

Interception of groundwater at the surface infrastructure (TSF, WRD, low-grade stockpile, heap leach pad etc.): Any excavations that will be made, will be shallow, and it is not expected that the groundwater level will be breached. There will be a small, localised, impact on the groundwater level at the HLP, where the footprint will be lined, but due to the already naturally low recharge from rainfall in the area, the relatively small footprint of the HLP compared to the sub-catchment, and the short time duration, this impact is considered to be low. The significance of this impact is expected to be **LOW**. It can be mitigated during planning and design of the infrastructure by avoiding areas of shallow groundwater, which are mostly associated with the alluvial aquifer in the river valley bottoms.

The WRD and low-grade stockpile will be located within the riverbeds, and in direct contact with the alluvial gravels that constitute the alluvial aquifer. It is not expected that there will be significant excavations during construction of the WRD and the low-grade stockpile, and therefore, no significant impact on the alluvial aquifer is expected from these two areas.

Interception of groundwater during construction of the open pit: During construction, the pit area will be prepared. The provided mine progression plan shows limited excavation of the pit area during the construction phase. Mining excavation activities will start in the higher lying areas, where the depth to groundwater level has been measured to be between 20 and 40 mbgl.

Results from the numerical groundwater flow model show that it is not expected that there will be significant interception of the groundwater level, and it is not expected that there will be a significant

reduction in the groundwater volume available in the aquifers. The significance of this impact is expected to be **LOW**. There is little that can be done to avoid or mitigate the impacts. It is recommended that the groundwater levels be monitored using dedicated groundwater monitoring boreholes.

Water storage in the off-channel water storage dam: The water storage dam will be constructed during the construction phase. Once the dam is built, water from the Orange River will be pumped into the dam. The dam will be unlined, and it is expected that water will recharge into the underlying aquifers. The dam will be constructed within a drainage valley, and therefore both the alluvial material associated with the bottom of the valley, and the fractured rock in the valley walls and underlying the alluvials at the valley bottom will be exposed to recharge from the dam. Chemical analysis of the water from the Orange River show that the water quality is much better than the natural groundwater qualities in the aquifers (please refer to Appendix A). Therefore, recharge from the dam into the aquifers is considered to be a positive impact.

Results from the numerical groundwater flow model shows that during the construction phase the impact on the aquifers will be **LOW**.

7.1.2 Operational Phase

The operational phase is defined as the 24 years of active mining, together with the subsequent 10 years of processing, thus spanning a total of 34 years.

Reduction in recharge at the heap leach pad: There will be a small, localised, impact on the groundwater level at the HLP, where the footprint will be lined, but due to the already naturally low recharge from rainfall in the area, the relatively small footprint of the HLP compared to the sub-catchment, and the short time duration, this impact is considered to be **LOW**.

Increase in recharge at the TSF: Wet deposition of tailings material onto an unlined facility can artificially increase recharge to the underlying aquifers. This will create a mounding of the groundwater levels underneath the facilities and can lead to changed groundwater flow patterns and velocities. Groundwater flow patterns can now be radially away from the TSF. The impact is considered to be **LOW**.

Increase in recharge at the WRD: Rainfall storage in the WRD can potentially artificially increase the recharge volume as well as the period over which recharge will take place. This significance of this impact is considered to be **LOW**, based on the low annual rainfall, combined with the high permeability of the alluvial material that forms the base of the WRD in the river channels. Due to the high permeability of the material, there will be little retardation of infiltration of the rainfall that do occur, therefore, the time delay in recharge will be insignificant.

Increase in recharge at the low-grade stockpile: Rainfall storage in the low-grade stockpile can potentially artificially increase the recharge volume as well as the period over which recharge will take place. This significance of this impact is considered to be **LOW**, based on the low annual rainfall, combined with the high permeability of the alluvial material that forms the base of the stockpile in the river channel. Due to the high permeability of the material, there will be little retardation of infiltration of the rainfall that do occur, therefore, the time delay in recharge will be insignificant.

Increase in recharge at the off-channel water storage dam: Water storage in the off-channel water storage dam will artificially increase recharge into the underlying alluvial material and fractured rock aquifers. Initial recharge will be relatively fast while filling the storage capacity of the aquifer material. Once the material is saturated the recharge rate will be controlled by the permeability of the material. Results from the numerical model show that seepage from the dam to the combined alluvial and fractured rock aquifers can be as high as 1 000 m³/day.

Recharge from the dam will immediately recharge the alluvial material. It is not currently known whether the alluvials at the dam site contain water year-round. Drilling higher up in the catchments show the alluvials to be dry, while the water supply boreholes drilled into the alluvials down gradient of the pit show that lower in the catchments there is water in the alluvials. Therefore, the impact from recharge from the dam is not certain. Following a worst-case approach, it is assumed that recharge from the dam will significantly increase the availability of water in the sediments. This is considered to be a positive impact based on the increased availability of water in the aquifer combined with the fact that the water that will recharge into the alluvials will be of good quality. Results from the numerical groundwater flow modelling show that the zone of influence of the artificial recharge is limited by the topography surrounding the dam. The zone of influence extends up to 250 m from the dam. On a catchment scale this impact is considered to be **LOW**.

Results from the numerical groundwater flow model show that the recharge will eventually reach the groundwater table in the fractured rock aquifer, which lies at an estimated 20 to 40 mbgl in the vicinity of the storage dam (no dedicated groundwater boreholes have been drilled in this area and the depth to groundwater level is extrapolated from measured boreholes). This will artificially increase the volume of water available in the fractured rock aquifer, which is seen as a positive impact. The recharging water quality will be significantly better than the natural groundwater quality in the fractured rock aquifer. Results from the numerical groundwater flow modelling show that the zone of influence of the artificial recharge is limited by the topography surrounding the dam. The zone of influence extends up to 200 to 250 m from the dam. On a catchment scale this impact is considered to be **LOW**.

Interception of groundwater during mining of the open pit: Note that active mine dewatering is expected to only occur during the initial 24 years of active mining. During the last 10 years of operations when only processing will take place, it is assumed that mine dewatering will stop.

During the 24-year operational phase the open pit will be dewatered, causing a drawdown in the groundwater level in the vicinity of the pit. The extent of the zone of influence of the drawdown cone is controlled by factors such as the pit bottom elevation, the aquifer transmissivity and the regional groundwater levels. Results from the numerical groundwater model show that the zone of influence of the groundwater level drawdown cone is controlled by the topography surrounding the pit. The zone of influence will be less than 1.5 km (please refer to Figure 7-1). The maximum depth of the pit is expected to be approximately 640 m and will stretch to 270 m below sea level. The vertical drawdown in the groundwater level will be controlled by the depth of the active aquifer, which is currently unknown due to the absence of packer test data to determine the change in aquifer permeability with depth below surface. It is expected that the drawdown in groundwater level will be in the order of 280 m at the pit. This means that the groundwater level will not be drawn down to the level of the bottom of the pit, but will be approximately 360 m above the bottom of the pit. However, there could be depressurisation in the deeper aquifers due to the reduction in overlying rock mass. Under the assumption that there is hydraulic activity to the maximum depth of the pit, depressurisation can cause a reduction in piezometric pressure of 60 bar (600 m head).

Within the zone of influence of the groundwater level drawdown lie some ephemeral rivers which are tributaries to the Volstruis River, and the Volstruis River itself, where there is very limited baseflow contribution from the fractured rock aquifer to the stream surface flow volumes.

The impact on the alluvial aquifer associated with the Volstruis Rivier, which will be mined out and removed during the operational phase, and the downgradient receptors, was assessed using the numerical groundwater flow model. The thickness of the alluvial material, as well as whether there is water present in the alluvial material year-round is currently unknown. Drilling higher up in the catchments show the alluvials to be dry, while the water supply boreholes drilled into the alluvials down gradient of the pit

show that lower in the catchments there is water in the alluvials. Therefore, the impact from mine dewatering cannot be determine to a high level of certainty. Locally, within a 250 m radius around the mine pit, the significance of this impact is expected to be **MODERATE**. Regionally, the proposed Haib pit will lie relatively high up in the Volstruis River catchment, and taking into consideration the entire length of the Volstruis River, and the Haib River into which the Volstruis River drains, the impact on the groundwater resource in the alluvial material is considered to be **LOW** on a regional scale.

There are no known anthropogenic receptors (privately owned groundwater supply boreholes) located in the zone of influence of the groundwater level drawdown cone.

There is little that can be done to avoid or mitigate the impacts. It is recommended that the groundwater levels be monitored using dedicated groundwater monitoring boreholes.

7.1.3 Decommissioning and Post-Closure Phases

Recovery of the water level in the mined-out pit: Mine dewatering will be stopped at the end of the active mining, thus at year 24 of the operational phase, allowing the water level in the mined-out pit to start to recover. It is not currently known whether the pit will be left open, or whether it will be partially backfilled. For the purpose of this assessment, it is assumed that the pit will be left open and no backfilling will take place. This assumption is based on the cost associated with backfilling the pit.

The decommissioning phase is expected to be relatively short (less than 12 or 24 months), which will not allow for a significant rise of the water level in the pit.

After completion of the decommissioning, in the post-closure phase, and up to 100 years after all mining activities stopped, the water level in the pit will continue to rise. The water level will reach a dynamic, seasonally controlled, equilibrium where the water levels will fluctuate within a range depending on the pit water balance. It is expected that this dynamic pit water level will still be below the regional groundwater levels of between 20 to 40 mbgl due to the combined effect of:

- Low annual rainfall.
- Low groundwater inflow volumes into the mine.
- High evaporation.

The water level in the pit remaining below the regional groundwater levels will ensure that groundwater flow directions around the pit will remain directed towards the pit. No decant is expected. The impact is expected to be **MODERATE**. This is a positive impact and does not require mitigation.

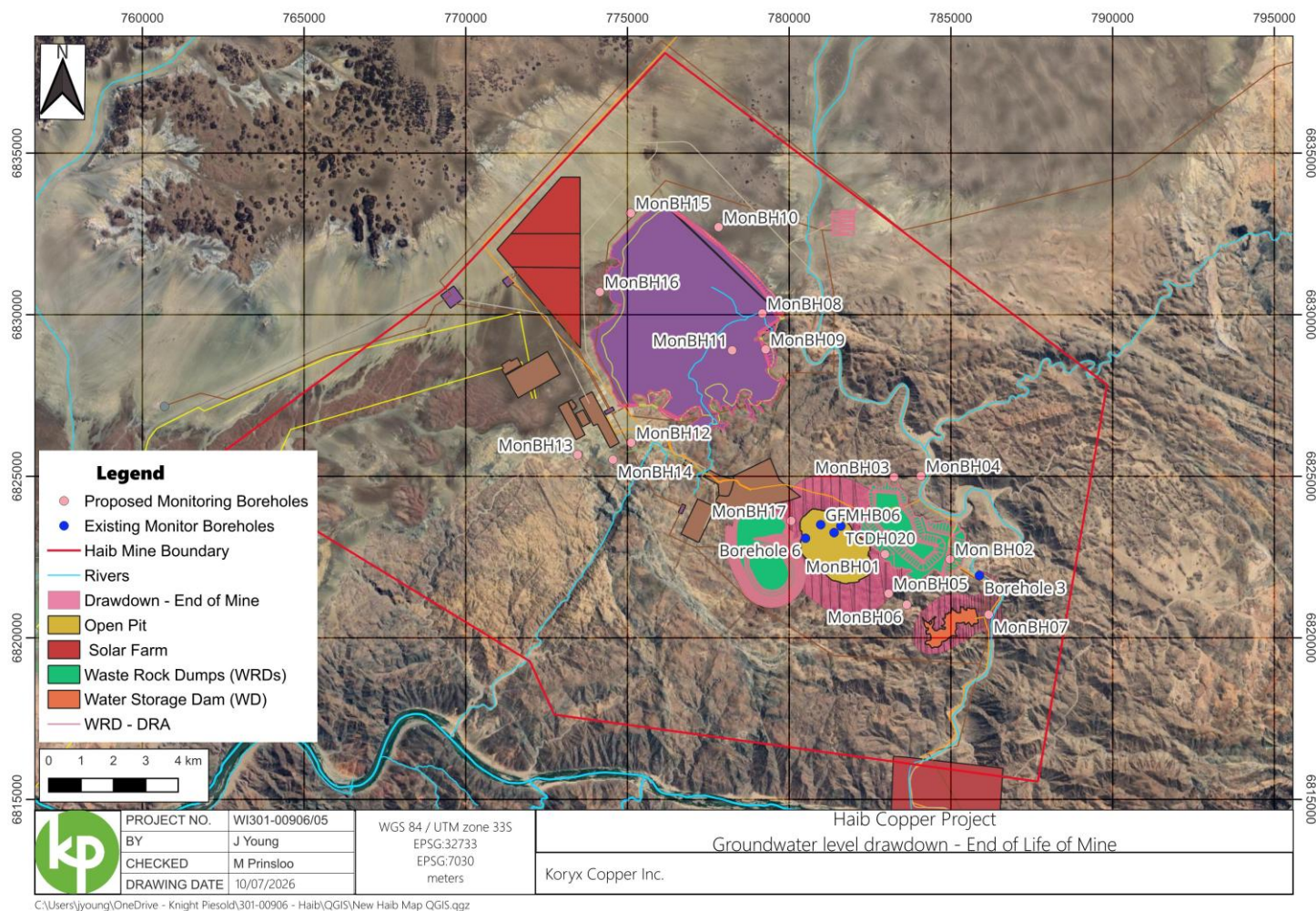


Figure 7-1: Groundwater level drawdown – zone of influence

7.2 Impacts on Groundwater Qualities

Seepage from surface stockpiles (waste rock, low grade ore, and tailings material), as well as recharge from the off-channel water storage dam, can have an impact on the underlying aquifers. Contamination that enters the underlying aquifers will migrate down gradient away from the footprints of the WRD, the low-grade ore stockpile, and the TSF. The quality of the developing pit lake water may be impacted by oxidation of the pit walls. Recharge from the off-channel water storage dam where water from the Orange River, which is of better quality than the natural groundwater, can improve the groundwater quality underneath and downgradient of the dam.

Groundwater contamination can occur through the spillage of hazardous substances or direct contamination. Additional impacts not currently foreseen will be identified through the ongoing groundwater and surface water monitoring program.

7.2.1 Construction Phase

Contamination through spillage and runoff: Spillage of hydrocarbons and other materials from construction vehicles can lead to contamination of the underlying aquifers. The risk is higher in the river channels where the alluvial aquifer, and an associated shallow groundwater level, is present. Contamination of the alluvial aquifer can lead to rapid downgradient migration of the contamination due to the high permeability of the alluvial material. This will be mitigated to some extent due to the high storage capacity of the material. The impact will be **MODERATE** in significance.

Contamination from the TSF and the heap leach pad: The infrastructure will not be operational during the construction phase, and therefore, no impacts on the groundwater qualities are expected.

Contamination from the WRD: It is expected that some material from shallow excavations at the pit and the surface infrastructure will be stored on the WRD. The volume of stored material is expected to be small, and the time duration is expected to be short. Results from the geochemical assessment show that the shallow, oxidised, material that will form the majority of the material that will be excavated during the construction phase is classified as potentially acid neutralising (please refer to Table 6-2). Aluminium and iron could leach from the material in concentrations that exceed the Namibian drinking water guidelines for excellent drinking water quality. The construction time period is currently unknown, but it is expected to be less than 24-36 months. Therefore, there will be limited time for oxidation and geochemical reactions to take place. Combined with low rainfall, little contamination is expected to enter the alluvial aquifer. The impact of leachate from the WRD on the groundwater resource is expected to be **MODERATE**.

Contamination from the high-grade and low-grade ore stockpiles: It is assumed that no high-grade, or low-grade, ore will be mined during the construction phase. Therefore, there will be no material stored on the footprints, and no impacts are expected.

Recharge of better-quality water from the off-channel water storage dam: Recharge from the off-channel water storage dam will improve the groundwater quality underneath and downgradient of the dam. The zone of influence of the water quality improvement will be limited due to the short timeframe of the construction phase and the fact that the dam will only be filled towards the end of the construction phase, thereby further reducing the water holding time during the construction phase.

7.2.2 Operational Phase

The operational phase is defined as the 24 years of active mining, together with the subsequent 10 years of processing, thus spanning a total of 34 years.

During the operational phase, the principal hydrogeological and geochemical risks relate to potential seepage and contaminant transport from the various mine waste and process water facilities (open pit, WRD, low-grade ore stockpile, TSF and heap leach pad). Representative samples of ore, waste rock and tailings were analysed as described in Section 6 of this report to characterise acid-generation potential and metal/metalloid leaching behaviour. The test work comprised static (acid–base accounting and metal leach tests) and, where required, kinetic tests. Estimated leachate concentrations were compared against:

- Namibian water quality standards (including the 2023 Water Resources Management Act standards for groundwater recharge and potable water);
- International Finance Corporation (IFC) guidelines; and
- World Health Organization (WHO) drinking water guidelines.

The results were then incorporated into a contaminant migration assessment to evaluate potential migration pathways and to identify appropriate mitigation measures over the life of mine (LoM).

Geochemical testing indicates that, from an acid-mine-drainage (AMD) perspective, material to be placed on the WRD, low grade stockpile, and within the TSF ranges from “potentially acid neutralising” to “uncertain”. However, leachate from these materials may contain elevated concentrations of aluminium and iron, as well as lead and molybdenum in some material. Based on results from the static and kinetic geochemical testing, as well as the geochemical model that was done, the expected element concentrations can be:

- Aluminium (cf. 0.15 mg/L “excellent” quality, Namibian Drinking Water Guideline):
 - WRD: Based on the geochemical modelling results, the aluminium concentrations at the WRD are expected to range from less than 0.1 mg/L at the start of operations, up to 0.22 mg/L at the end of the operational phase.
 - Low-grade stockpile: Results from the geochemical model show that during the operational phase aluminium concentrations are expected to start at near 0 mg/L and increase to approximately 0.29 mg/L at the end of the operational phase.
 - TSF: The geochemical model shows that it is expected that the Al concentrations will increase to around 1.20 mg/L in year 14 of the operations, after which the concentrations show a stabilising trend at approximately 1.30 to 1.35 mg/L.
- Iron: (cf. 0.1 mg/L “excellent” quality).
 - WRD: Although the static leach results indicated iron concentrations of 1.1–2.5 mg/L, the kinetic leach testing, and the geochemical model showed iron concentrations below 0.05 mg/L.
 - Low-grade stockpile: Results from the geochemical testing and model show that during the operational phase iron concentrations are expected to be below detection limits.
 - TSF: Similar to the waste material, the kinetic leach test results and the geochemical model showed iron concentrations in the tailings material of less than 0.05 mg/L.
- Molybdenum (cf. 0.05 mg/L “excellent” quality):
 - WRD: While the static leach test results showed molybdenum concentrations of between 0.07–0.29 mg/L, the kinetic leach test results showed concentrations that generally were below detection limit (0.005 mg/L).
 - Tailings: The kinetic leach test results showed molybdenum concentrations ranging between 0.01 and 0.096 mg/L. The concentrations increase slightly over time from around 0.01 mg/L to 0.07 mg/L in the later test results.

These concentrations indicate a potential risk of localised deterioration in groundwater quality in the underlying aquifers if seepage is not effectively managed. However, note that the natural groundwater

qualities for these elements already don't comply with the water quality guidelines as described in Section 4.5 of this report (please refer to Table 4-4 and Appendix A). Therefore, the cumulative impact on compliance with water standards is technically of no consequence.

The key operational impacts and associated hydrogeological implications are summarised below.

Low-grade stockpile: The current project plan indicates that the low-grade stockpile will be unlined and will be located in river valleys west of the pit, where alluvial aquifers are present in the valley floors and the upper fractured-rock aquifer is exposed in the valley walls. The proposed stockpile spans two main drainage sub-catchments that drain into the mine pit, with some minor drainage channels that could drain into other sub-catchments.

Leachate from the stockpile is expected to percolate vertically into the alluvial aquifer at the valley base and laterally into the upper fractured-rock aquifer along the valley flanks. Due to the low natural rainfall, there will be little contaminated leachate emanating from the WRD.

In the alluvial aquifer, contaminants from the low-grade stockpile will migrate downgradient along the valley axes, and into the pit. Migration of the contaminants towards the pit will be increased due to the fact that the stockpile partially overlies the groundwater level drawdown cone that will develop around the pit due to the mine dewatering (please refer to Figure 7-2). With the seepage contained within the pit, there will be no additional salt load contribution to the Haib River.

This, combined with the fact that seepage into the pit will be dewatered from the pit, results in a **MODERATE** impact on the water quality in the alluvials.

In the upper fractured-rock aquifer, seepage will enter the fracture network and migrate down-gradient away from the stockpile, with the aquifer discharging seepage into the pit. With the seepage discharged into the pit, the impact on the fractured rock-aquifer is rated as **MODERATE**.

Waste Rock Dump (WRD): Similar to the low-grade stockpile, the WRD will be unlined and will be located in river valleys, where alluvial aquifers are present in the valley floors and the upper fractured-rock aquifer is exposed in the valley walls. The WRD is located within the same main tributary as the low-grade stockpile, but to the east of the pit, and it touches on the main Haib River channel.

Leachate from the WRD is expected to percolate vertically into the alluvial aquifer at the valley base and laterally into the upper fractured-rock aquifer along the valley flanks.

In the alluvial aquifer, contaminants from the WRD will migrate downgradient along the valley axes and the alluvials. The groundwater level drawdown cone that will develop around the pit due to mine dewatering will partially underlie the WRD, thereby drawing contamination from the western portion of the WRD towards the pit (please refer to Figure 7-2). Seepage from the eastern portion of the WRD will migrate towards the Haib River east of the WRD and impact the water quality in the alluvial aquifer associated with the Haib River. Results from the numerical contaminant migration model show that leachate from the WRD at 1.4 mg/L aluminium will mix with the relatively good quality water in the alluvials (aluminium concentration in the alluvials has been shown to be in the range of 0.0074 to 0.76 mg/L with an average of 0.04 mg/L).

Due to the low natural rainfall, there will be little contaminated leachate emanating from the WRD. This, combined with the potentially relatively large volume of water in the Haib River alluvials, results in a **MODERATE** impact on the water quality in the Haib River alluvials. Results from the numerical contaminant migration model shows that the aluminium concentration within the alluvials will remain below the Namibian Drinking Water Quality Guideline for "excellent" water of 0.15 mg/L. The plume is expected to migrate down gradient for 2.5 km to the where the tributary within which the off-channel water storage dam will be located joins the main Haib River channel. Over the 2.5 km migration path the element concentrations will further reduce due to mixing with the good quality water in the Haib

River alluvials. It is expected that, under the assumption that there will be migration of good quality water from the storage dam via the alluvials into the Haib River alluvials, any elevated element concentrations migrating from the eastern WRD will be further diluted to a point where the plume cannot be distinguished anymore.

The salt load contribution to the alluvial aquifer will only be during and directly after rainfall events. Depending on the annual rainfall, it is calculated that the aluminium salt load contribution to the alluvial aquifer is 21 to 136 kg aluminium per annum.

Water supply boreholes Borehole 1, 2, and 3 to the mine exploration drilling program fall within the potential contaminant plume from the WRD.

In the upper fractured-rock aquifer, seepage will enter the fracture network and migrate down-gradient away from the WRD. As mentioned previously, the western portion of the WRD falls within the zone of influence of the groundwater level drawdown cone that will develop around the pit due to mine dewatering. This will draw contamination from the western portion of the WRD into the pit. Seepage from the eastern portion of the WRD will migrate towards the Haib River and some of this water can potentially discharge into the alluvial aquifer further downstream. Results from the contaminant migration modelling show that the plume from the WRD that migrates through the fractured rock can reach the Haib River during year 3 of the operational phase. The plume will continue to expand over time and the seepage front, as well as the element concentrations, will increase until the end of the operational phase.

Important to note is that the groundwater chemical analysis results indicate that the natural groundwater in the fractured rock aquifer have an aluminium concentration with a median of 0.187 mg/L, and a mean of 0.303 mg/L, both of which exceeds the Namibian drinking water guideline for excellent water of 0.15 mg/L, and which are close to the expected diluted seepage concentrations. Therefore, it can be said that while the aluminium concentrations entering the Haib River alluvial sands will increase the natural aluminium concentrations somewhat, it will remain much the same as previously, when it already exceeded the Namibian drinking water quality standards.

On the basis of the geochemical and hydrogeological assessment, the impact significance of the unlined WRD on the alluvial aquifer is **MODERATE** based on the extent and severity of the impact, while the impact on the fractured rock aquifer is **MODERATE** because the contamination will be partially drawn towards the pit.

Recommended mitigation and monitoring include:

- Installation of dedicated monitoring boreholes in both the alluvial and upper fractured-rock aquifers downgradient of the WRD to detect early contaminant migration.
- If seepage is detected, installation of an interceptor trench within the alluvial aquifer and scavenger (pump-and-treat) wells in the alluvial and/or fractured-rock aquifers, designed and positioned by a suitably qualified hydrogeologist to optimise plume interception.

Tailings Storage Facility (TSF): TSF 4 is proposed west of the pit in an area of relatively subdued topography underlain by Vioolsdrif granite and Karoo sandstone/shale. Several ephemeral drainage channels traverse the area, draining eastwards. The larger eastwards draining surface stream channels are characterised by the presence of the alluvial aquifer. These drainage channels are tributaries to the Haib River, and joins the Haib River approximately 700 m downstream of the TSF wall.

The aluminium concentrations migrating away from the TSF is expected to be in the range of 2 mg/L, which exceeds the Namibian drinking water quality guideline for excellent water of 0.15 mg/L. As with the WRD and the low-grade ore stockpile, the natural groundwater quality is indicated to be in the order

of 0.0074 to 0.76 mg/L with an average of 0.04 mg/L within the alluvial aquifer, and around 0.303 mg/L in the upper fractured rock aquifer.

The TSF will be unlined; therefore, seepage is anticipated to infiltrate into the underlying alluvial and upper fractured-rock aquifers and migrate generally eastwards along the regional hydraulic gradient.

Similar to the case at the WRD and the low-grade stockpile, it is expected that the contamination that enters the alluvial aquifer will migrate downgradient away from the TSF. The alluvial aquifer extends to the confluence with the Haib River, and the contamination in the alluvial aquifer will reach the Haib River within 6 months to 1 year, depending on the site-specific characteristics of the alluvial aquifer, and the rainfall recharge driven flows in the alluvial material. The aluminium concentration is expected to increase over time and reach 0.45 mg/L by the end of life of the mine (year 24), and 0.55 mg/L by the end of the operational phase (year 34).

Outside of the alluvial aquifer in the drainage channel, the plume will also migrate towards the Haib River through the surface sand cover that exists to the north of the channel, and the upper fractured rock material that outcrops to the south of the channel (please refer to Figure 7-2). Results from the numerical contaminant migration model show that north of the channel the plume will reach the Haib River at around year 17 of the life of operations, and south of the channel the plume reaches the Haib River between years 24 and 25 of the life of operations. The contaminant plume will develop further, and the element concentrations entering the Haib River alluvials will increase over time to the end of the operational phase (year 34).

The Farm Borehole, identified during the 2025 hydrocensus lies very close to the western (upgradient) boundary of the TSF. It is possible that the elevated driving head in the TSF will push contamination towards the Farm Borehole. Due to the close proximity of the borehole to the TSF, it is expected that the aluminium concentration will be close to that in the leachate emanating from the TSF, thus in the order of 2 mg/L based on current knowledge. It is reported that the property will be bought by Haib Minerals to establish the TSF, HLP, and other infrastructure. Therefore, it is expected that the borehole will not be used for water supply in future.

The impact significance of seepage from the unlined TSF is assessed as **MODERATE**, primarily due to:

- The permanence of any contamination introduced to the aquifer.
- The high likelihood of seepage occurring.

rather than severe or wide-ranging effects. With distance from the TSF, element concentrations are expected to decrease through mixing with uncontaminated groundwater and periodic recharge events.

Recommended mitigation and monitoring:

- Installation of monitoring boreholes downgradient (east) of the TSF to track potential plume development.
- Including the Farm Borehole in the monitoring program.
- If seepage impacts are detected, installation of scavenger wells and/or an interceptor trench to capture and manage the migrating plume.

Heap Leach Pad (HLP): The heap leach pad will be double-lined (or equivalent engineered liner system) and designed to fully collect pregnant leach solution at the base for recirculation and processing, with no planned discharge.

Assuming effective design, installation, operation and maintenance of the liner and collection systems:

- Direct seepage to groundwater from the HLP is not anticipated.

- Potential impacts on groundwater resources are therefore expected to be negligible.

The impact significance associated with the HLP is assessed as **MODERATE**. Nonetheless, it is recommended that:

- A small network of downgradient monitoring boreholes be installed to confirm liner performance and provide early warning of any unexpected leakage.

Open Pit: During operations, oxidation of exposed pit wall rock may slightly degrade the quality of groundwater seeping into the pit. Pit inflows will be collected by the dewatering system and water will be reused in the mine water circuit.

Dewatering will induce a local drawdown cone around the pit, re-directing groundwater flow towards the excavation.

This hydraulic sink will capture any contaminated seepage in the vicinity of the pit and prevent significant off-site migration of contaminants during the operational phase.

The impact of pit-related contamination on off-site groundwater resources is therefore rated as **MODERATE** in significance.

Recommended measures:

- Installation of a ring of dedicated monitoring boreholes around the pit to track groundwater levels and quality;
- If monitoring indicates contaminant migration beyond the drawdown cone, installation of scavenger wells to intercept and recover affected groundwater.

Spillage and Runoff from Mine Infrastructure: Hydrocarbon spills and leaks from vehicles, fuel storage and maintenance areas, as well as accidental releases of process chemicals, can infiltrate the subsurface and affect groundwater quality.

The risk is highest along river channels where permeable alluvial aquifers occur at shallow depth and groundwater levels are close to the surface.

In these settings, contaminants can migrate relatively rapidly downgradient within the alluvial aquifer due to high permeability, although some attenuation will occur owing to the relatively high storage (and sorption capacity) of the alluvial sediments.

The significance of this impact is assessed as **MODERATE**, driven mainly by:

- The persistence of hydrocarbon contamination in the subsurface.
- The potential for localised impairment of groundwater and shallow surface water resources.

This risk should be managed through:

- Implementation of strict spill prevention, containment and clean-up procedures.
- Appropriate lining and drainage controls in high-risk areas (e.g. fuel handling zones).
- Targeted groundwater monitoring in vulnerable alluvial zones.

In summary, while geochemical testing indicates a generally low risk of sustained acid mine drainage, the potential for localised elevation of certain metals and metalloids in leachate from unlined WRD, low-grade stockpile, and the TSF represents the primary groundwater quality concern during operations. These risks are manageable through appropriate engineering design, operational controls, and a suitably designed monitoring and response program.

Recharge of better-quality water from the off-channel water storage dam: Recharge from the off-channel water storage dam will improve the groundwater quality underneath and downgradient of the dam. The zone of influence of the water quality improvement will be limited to approximately 250 m.

7.2.3 Decommissioning and Post-Closure Phases

During the decommissioning phase surface infrastructure will be decommissioned. The closure plan is under development and thus, it is currently unknown whether the TSF and WRD will be sloped and capped. It is also not known whether the low-grade stockpile will be removed and processed. Mine dewatering will stop, allowing the water level in the pit to start rebounding. Note that dewatering of the pit will stop at the end of the active mining phase, which is in year 24 of the operational phase. This will allow recovery of the water level in the pit for 10 years until the end of the operational phase (year 34) when process of mined ore will stop. Impacts for the post-closure phase were assessed up to 100 years after the operational phase stopped.

Contamination through spillage and runoff: Spillage of hydrocarbons and other materials from construction vehicles can lead to contamination of the underlying aquifers. The risk is higher in the river channels where the alluvial aquifer, and an associated shallow groundwater level, is present. Contamination of the alluvial aquifer can lead to rapid downgradient migration of the contamination due to the high permeability of the alluvial material. This will be mitigated to some extent due to the high storage capacity of the material. The impact will be **MODERATE** in significance.

Decommissioning and closure of the TSF: Post closure seepage away from the facility will continue. Wet deposition of tailings material will stop, and seepage will be driven by rainfall recharge into the tailings material. Based on the low permeability of the TSF, and the low annual rainfall, the seepage is expected to decrease significantly. Sloping and capping of the TSF (should it form part of the eventual closure plan) will further reduce rainfall infiltration and oxidation of the tailings material, thereby reducing the potential impacts from the TSF in the long-term.

Irrespective of whether the TSF will be sloped and capped, the seepage from the TSF will reduce. This will reduce the contamination migrating away from the TSF in the post-closure phase, and the plume will stabilise. Results from the contaminant migration modelling show that the contaminant plume at 50 years post-closure is much the same as at 100 years post-closure. The contaminant plume at 100 years post-closure is shown in Figure 7-3.

As described in operation phase, the impact remains **MODERATE** in significance. The high ratings are mainly due to the permanence and the definite likelihood of it occurring, rather than the severity and the extent of the impacts. Post closure monitoring boreholes must be installed down gradient of the TSF to monitor for contaminant migration away from the TSF. These measures must be outlined in a detailed mine closure plan.

Decommissioning and closure of the low-grade stockpile: Post closure seepage away from the facility will continue. Due to no new material being deposited, the contaminant concentrations will start to reduce over time as elements are leached from the material stockpiled. The plume will stabilise based on natural attenuation from rainfall recharge (expected to be very little), and mixture with uncontaminated groundwater, as well as the expected reduction in pollution source concentrations.

The majority of contamination from the low-grade stockpile migrates towards the east, and into the pit which continues to act as a drain due to the expected low level of the pit lake. The level of the pit lake is expected to be low based on the climatic conditions (very low rainfall combined with high evaporation) and the low groundwater inflow volumes – note that a detailed pit lake water balance still must be compiled. Portions of the plume might spill over to adjacent sub-catchments to the west and south of

the WRD. This can be reduced, or avoided, by ensuring the stockpile footprint is limited to the specific sub-catchment.

As described in operational phase assessment, the impact remains **MODERATE** in significance. Post closure monitoring boreholes must be installed down gradient of the stockpile to monitor for contaminant migration away from it. These measures must be outlined in a detailed mine closure plan.

Decommissioning and closure of the WRD: Post closure seepage away from the facility will continue. Due to no new material being deposited, the contaminant concentrations will start to reduce over time as elements are leached from the WRD. The plume will stabilise based on natural attenuation from rainfall recharge (expected to be very little), and mixture with uncontaminated groundwater, as well as the expected reduction in pollution source concentrations. Results from the contaminant migration modelling show that there is little difference between the plume at the start of the closure phase, and then 50 and 100 years post-closure.

As described in Section 7.1.2 and 7.2.2, the WRD is partially underlain by the groundwater level drawdown cone that will develop around the pit. This will cause the plume from the western portion of the WRD to migrate into the pit. Contamination from the eastern portion of the WRD will migrate to the Haib River and enter the alluvials there. In Section 7.2.2 it was detailed that the contaminant plume migrating towards the Haib River is expected to reach the river by year 3 of the operational phase following which the plume will continue to expand over time and the seepage front. Results from the contaminant migration modelling show that during the post-closure phase the plume will stabilise and have limited growth compared to the operational phase.

Results from the contaminant migration modelling show that the mixing of seepage from the WRD with the relatively good quality water in the Haib River alluvials will continue in the post-closure phase. The impact of this on the element concentrations in the alluvials will be limited due to a combination of the low rainfall and the expected relatively large volume of good quality water contained within the alluvials. Modelling results show that the aluminium concentrations in the alluvials are expected to increase from around 0.04 mg/L to 0.18 mg/L at 20 years post-closure where it will stabilise. By 100 years post-closure the aluminium concentration is calculated to still be in the order of 0.18 mg/L.

As described in operational phase assessment, the impact remains **MODERATE** in significance. The high ratings are mainly due to the permanence and the definite likelihood of it occurring, rather than the severity and the extent of the impacts. Post closure monitoring boreholes must be installed down gradient of the TSF to monitor for contaminant migration away from the TSF. These measures must be outlined in a detailed mine closure plan.

Stopping of mine dewatering: Mine dewatering will be stopped, allowing the water level in the mined-out pit to start to recover as described in Section 7.1.3 of this report. The decommissioning phase is expected to be relatively short (less than 12 or 24 months), which will not allow for a significant rise of the water level in the pit. The water level will not rise sufficiently during the decommissioning phase that the groundwater flow directions will revert to near pre-mining conditions with contaminant migration away from the mine pit. It is not expected that significant contaminant migration away from the pit will occur.

After completion of the decommissioning, in the post-closure phase, the water level in the pit will continue to rise. The water level will reach a dynamic, seasonally controlled, equilibrium where the water levels will fluctuate within an expected range between 20 to 40 mbgl. This will ensure that groundwater flow directions around the pit will remain directed towards the pit, ensuring that the pit continue to act as a sink, and effectively prevent contaminant migration away from the pit towards the surrounding aquifers.

The impact will be **MODERATE** in significance. It is recommended that groundwater quality monitoring through dedicated should continue in the post-mining phase. Should there be impacts, it can be mitigated by scavenger wells.

Recharge of better-quality water from the off-channel water storage dam: It is assumed that the dam will be emptied after completion of the operational phase. This will remove the positive impact the recharge from the dam to the underlying aquifers has on the groundwater quality. This will also remove the mitigating impact the dam has on the water quality in the Haib River alluvials. Over time, the groundwater quality will degrade to near pre-development concentrations.

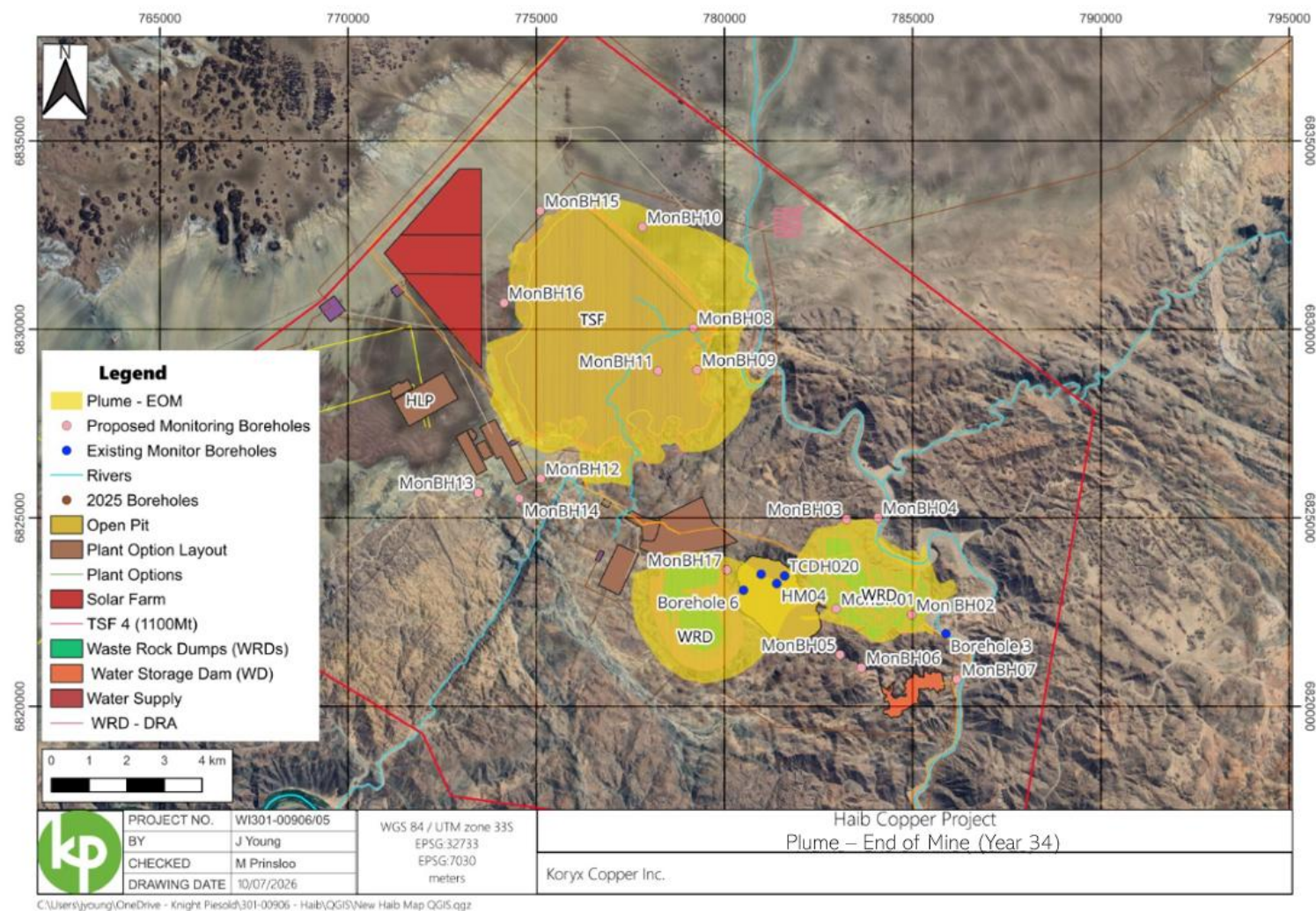


Figure 7-2: Contaminant plume at the end of life of mine

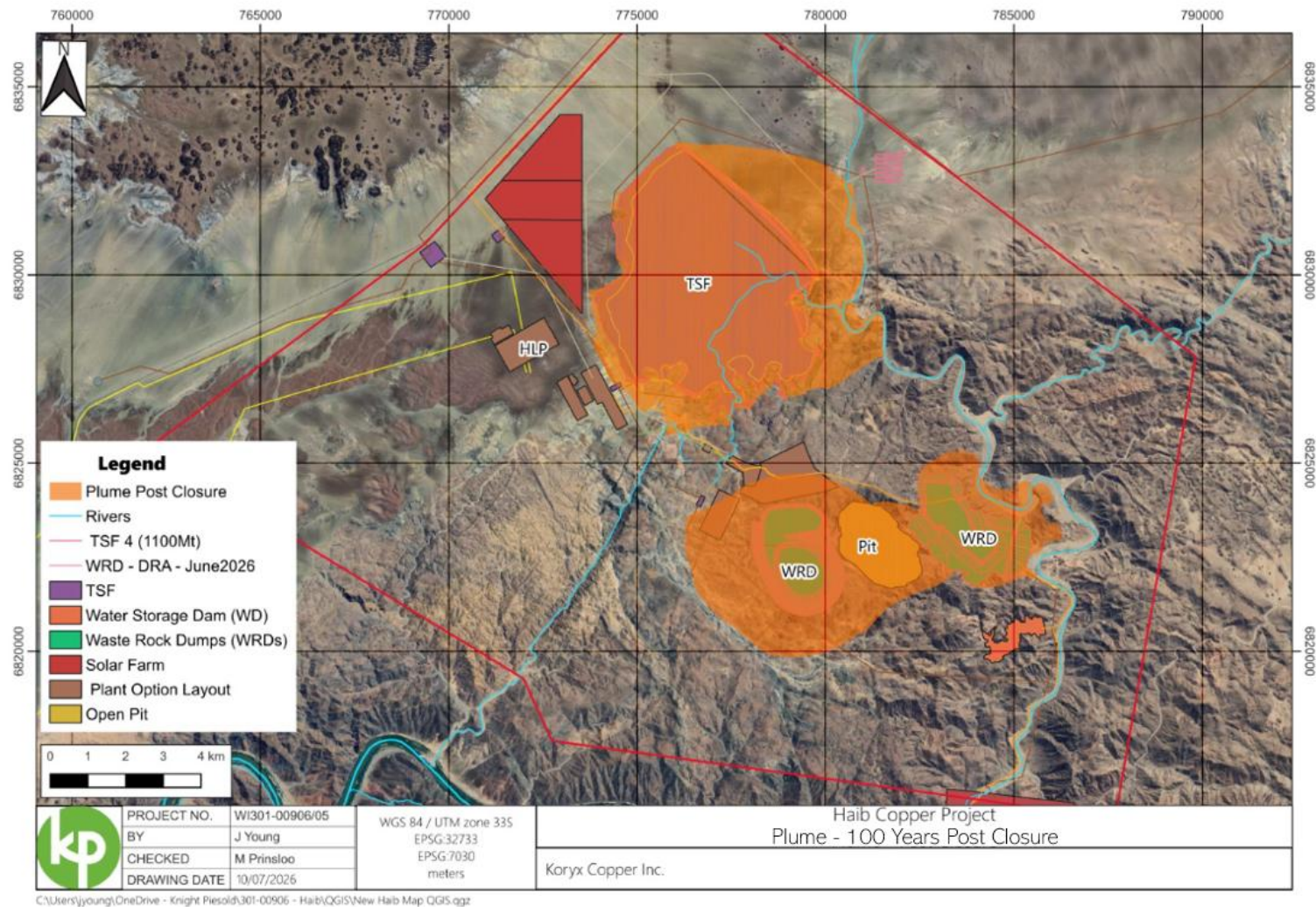


Figure 7-3: Contaminant plume 100 years post-closure

8.0 ASSUMPTIONS, UNCERTAINTIES AND RECOMMENDATIONS

- There are no dedicated groundwater boreholes drilled during this pre-feasibility level study. Reference was made to existing exploration, drilling water supply, and privately owned boreholes to obtain information on depth to groundwater level and for collection of groundwater samples for chemical analysis. It is recommended that dedicated groundwater monitoring boreholes be installed at the pit, WRD, low-grade stockpile, TSF and water storage dam as detailed in Section 9 of this report.
- There is no information available on the thickness and saturation level of the alluvial material associated with the river channels. In addition, there is little information available on the depth to groundwater level, and the groundwater quality (except for chemical analysis of water supply boreholes 3 and 6), in the alluvial material. Drilling higher up in the catchments show the alluvials to be dry, while the water supply boreholes drilled into the alluvials down gradient of the pit show that lower in the catchments there is water in the alluvials. It is recommended that dedicated groundwater boreholes be installed and the thickness of the alluvial material as well as the depth to groundwater level and groundwater quality be determined.
- From discussions with the site geologist, and observations of the exploration drilling core, it is estimated that the extensive fracturing of the competent rock that can be seen in the vicinity of the pit, the low-grade stockpile, and the WRD extend to 40 m below surface. The depth of the fracturing, and the variation in thickness over the extent of the site, is not known to a high level of certainty. It is recommended that a detailed assessment of the exploration drilling core be done via an assessment of the core photo database.
- The thickness and permeability of the sand cover that underlies a portion of the proposed TSF footprint is not known. It is recommended that this be assessed as part of further studies.
- The change in permeability of the fractured rock aquifer with depth, as well as the differential in permeability associated with different lithologies is not known. It is recommended that aquifer testing (falling-head, pump and packer testing) be done to better characterise the aquifer permeability and storage.
- Water and leach qualities at the TSF were simulated as part of a semi-closed system with water recycle from the TSF back to the plant. This could lead to increase in element concentrations over time. Better quality make-up water will dilute the element increase. The make-up water volume is not known at present, and a worst-case scenario with no make-up water dilution was simulated. It is recommended that the geochemical model be updated once the TSF water balance is finalised.
- Construction and design of the off-channel water storage dam is not known. The dam is planned to be located within a valley type drainage channel with an earthfall dam wall. The alluvial material is present in the bottom of the drainage valley while the walls of the valleys consist of exposed upper fractured rock material. Water stored in the dam can seep away via the alluvial material and/or the exposed highly fractured rock. Results from the numerical groundwater flow model show that seepage from the dam to the combined alluvial and fractured rock aquifer can be up to 1 000 m³/day. Uncertainties in the assessment include:
 - Will the alluvial and upper fractured material be excavated during construction of the dam, thereby stopping seepage from the dam towards these aquifers outside of the dam?
 - The thickness of the alluvial aquifer and the depth to which the host geology is highly fractured is not known. In addition, no specific aquifer testing has been done to

determine the aquifer permeabilities. Therefore, the calculated seepage volumes are considered to be of low confidence. It should be noted that during drilling of boreholes at the TSF total loss of drilling fluid / water was reported on the upper 5 to 6 m below surface, indicating notable seepage losses in this zone.

- In the event that there is high seepage volumes from the dam, the abstraction volumes from the Orange River will have to be increased to meet the cumulative demand (operational water requirement, seepage from the dam to the aquifers, evaporation from the dam).
- It is recommended that additional studies be done to increase the level of confidence in the calculated seepage volumes.
- It is recommended that a dedicated groundwater monitoring program be implemented.
 - Conceptual positions for the proposed borehole positions are shown in Figure 8-1 and Figure 8-2 for the pit, WRD, and water storage dam areas; and the TSF area respectively. The borehole positions should be confirmed and finalised based on the finalised surface layout, as well as a ground geophysical survey targeting identifying underlying geological features that could act as preferential groundwater flow and contaminant migration pathways.
 - The boreholes should be monitored on a quarterly basis, where the depth to groundwater level is measured, and groundwater samples are collected for chemical analysis. The samples should be analysis for a similar suite of parameters as the current groundwater monitoring program.
- Should the monitoring program show that there is contamination migrating away from the pit, the low-grade stockpile, WRD, and/or the TSF, then cut-off trenches should be installed to intercept shallow seepage through the weathered zone, or the alluvial material. Deeper scavenger wells should be installed to intercept the contaminant migration through fault and fracture, or weathered zones in the fractured rock aquifer. Conceptual positions are shown in Figure 8-1 and Figure 8-2.

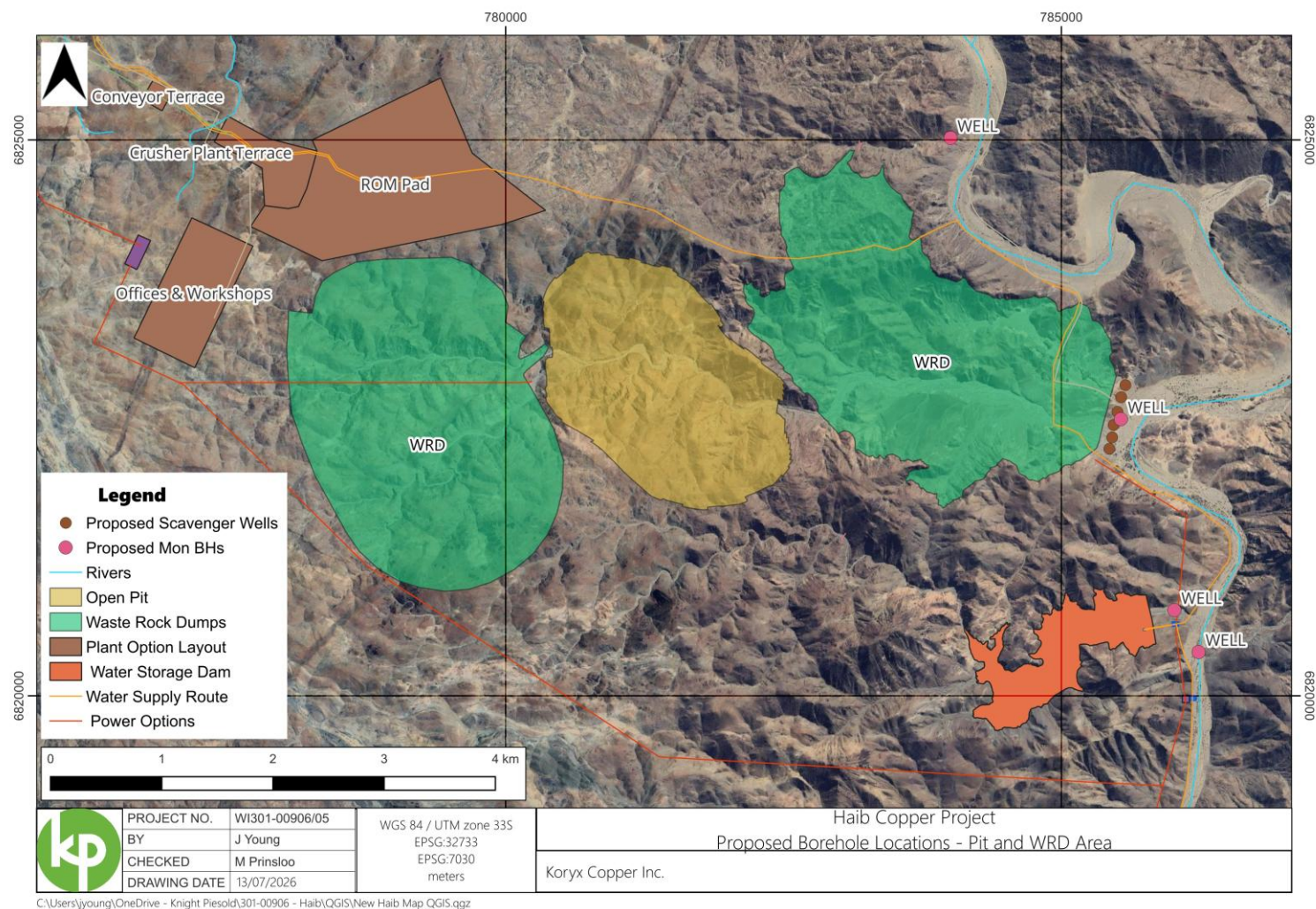


Figure 8-1: Proposed monitoring and scavenger borehole positions – pit and WRD areas

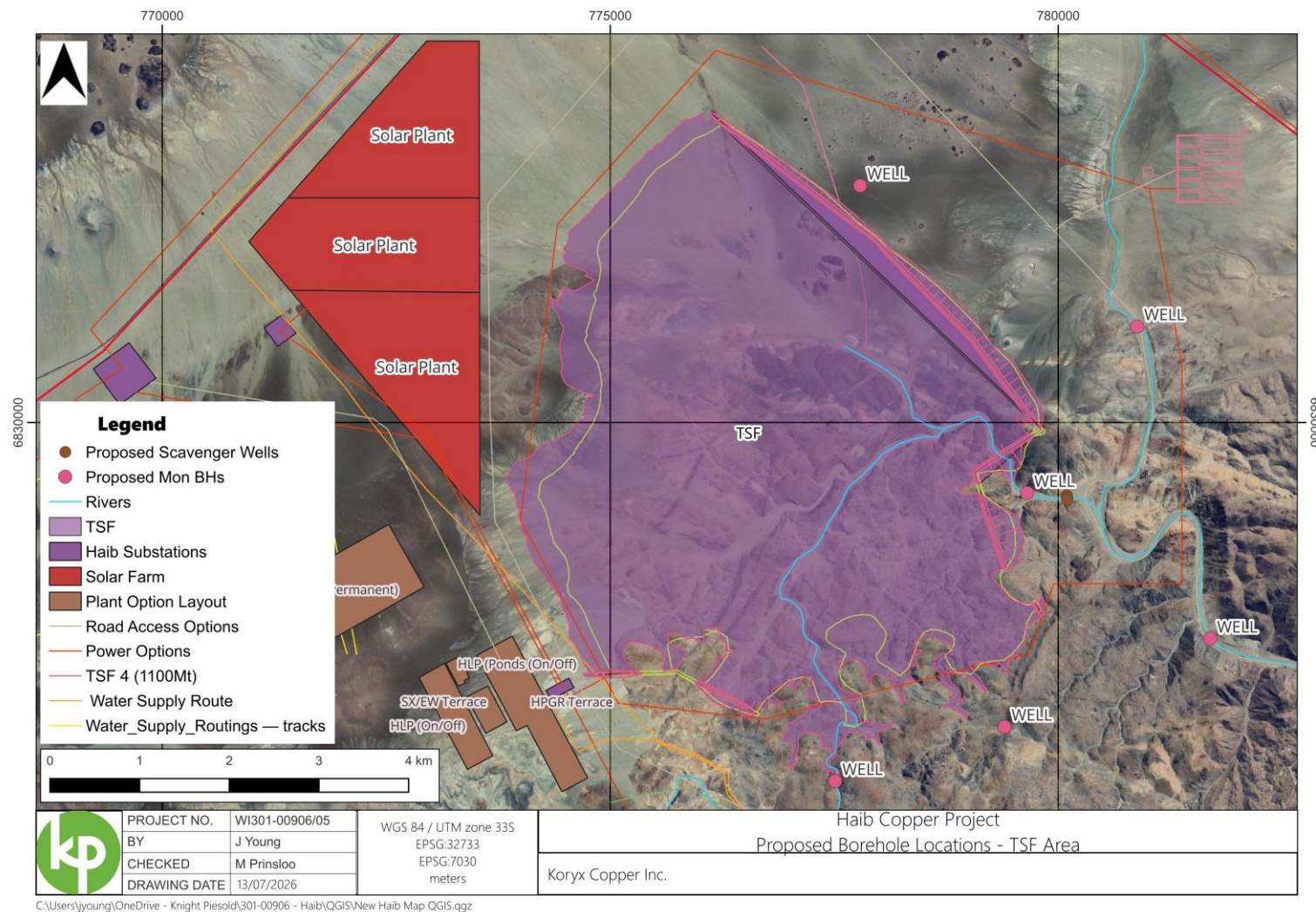


Figure 8-2: Proposed monitoring and scavenger borehole positions – TSF area

9.0 CONCLUSIONS

9.1 Groundwater Quantity

Regional context

- Mining will cause both local increases (mounding) and decreases (drawdown) in groundwater storage and flows.
- Overall impacts on regional groundwater availability are predicted to be limited and spatially constrained.

Open pit and dewatering (construction to post-closure)

Construction:

- Initial pit preparation occurs above the water table; groundwater interception is not expected.
- Drawdown and storage impacts during construction are LOW.

Operations:

- Pit dewatering will generate a drawdown cone with an extent <1.5 km from the pit.
- Groundwater flow within the zone of influence of the groundwater level drawdown cone will be redirected towards the pit, reducing baseflow contributions from the fractured aquifer to nearby ephemeral channels.
- The alluvial aquifer in the Volstruis River will be locally removed in the pit area (locally MODERATE impact), at catchment scale the effect on alluvial groundwater resources is LOW.
- No known private groundwater users fall within the drawdown zone.

Decommissioning and post-closure:

- Stopping dewatering initiates gradual rebound; recovery during the short decommissioning phase is limited.
- In the long term, the pit forms a pit lake with water levels stabilising below the regional groundwater table (~20–40 mbgl), maintaining groundwater flow towards the pit and preventing decant.
- This represents a LOW-significance, positive control on regional groundwater flow and containment of contaminants.
- WRD, low-grade ore stockpile, TSF and HLP – recharge modification and mounding.

WRD (unlined, in river valleys):

- Rainfall infiltration through WRD will artificially increase recharge to underlying alluvial and upper fractured aquifers, creating localised groundwater mounding and increased flow along valley axes.
- Due to low rainfall and high alluvial permeability, impacts on regional groundwater quantity are LOW and spatially confined.

Low-grade stockpile (unlined, in river valleys)

- Rainfall infiltration through stockpile will artificially increase recharge to underlying alluvial and upper fractured aquifers, creating localised groundwater mounding and increased flow along valley axes.
- Due to low rainfall and high alluvial permeability, impacts on regional groundwater quantity are LOW and spatially confined.

TSF (unlined):

- Wet deposition will enhance deep percolation, causing mounding beneath the facility and radial outward flow, mainly along alluvial channels towards the Haib River.
- Contribution to regional groundwater volumes is modest but hydrogeologically important in controlling plume migration; overall quantity impact is LOCAL and LOW to MODERATE.

HLP (double-lined):

- Lined footprint will reduce natural recharge and cause a minor localised lowering of groundwater levels beneath the pad.
- Given small footprint, arid climate, and limited operating period, impacts on groundwater quantity are LOW.
- Construction phase for surface infrastructure:
- Excavations are generally shallow and not expected to breach the regional water table except possibly in shallow alluvial zones; resulting quantity impacts are LOW and localised.

Seepage from the off-channel water storage dam:

- Water storage in the off-channel water storage dam will artificially increase recharge into the underlying alluvial material and fractured rock aquifers. Initial recharge will be relatively fast while filling the storage capacity of the aquifer material. Once the material is saturated the recharge rate will be controlled by the permeability of the material.
- Recharge from the dam will significantly increase the availability of water in the sediments. This is considered to be a positive impact based on the increased availability of water in the aquifer combined with the fact that the water that will recharge into the alluvials will be of good quality. Results from the numerical groundwater flow modelling show that the zone of influence of the artificial recharge is limited by the topography surrounding the dam. The zone of influence extends up to 250 m from the dam.

9.2 Groundwater Quality

Geochemical context

- Waste rock, low-grade stockpile, and tailings are predominantly “potentially acid-neutralising” to “uncertain” in terms of AMD potential.
- Leachates may contain elevated aluminium, iron, lead and molybdenum relative to Namibian “excellent” standards and IFC/WHO guidelines.
- Baseline groundwater already exhibits aluminium above “excellent” thresholds; mine-related increases are generally moderate relative to background.

Construction phase

Spills and runoff (all facilities):

- Hydrocarbon and chemical spills from construction activities present a MODERATE risk to groundwater quality, higher in river valleys with shallow alluvial aquifers.
- Rapid downgradient migration is possible in alluvium but partly mitigated by high storage and sorption capacity; standard spill management can control this.

Early high-grade ore material placement:

- Not expected that any high-grade ore will be mined and stored during the construction phase, therefore, no impact is expected.

Early low-grade ore material placement:

- Not expected that any low-grade ore will be mined and stored during the construction phase, therefore, no impact is expected.

Early WRD material placement:

- Limited volumes of shallow, oxidised, generally neutralising material may leach aluminium and iron at concentrations above “excellent” standards.
- Small volumes, short duration (<24 months) and low rainfall mean leachate impacts are expected to be LOW and localised.

TSF and HLP:

- Not operational during construction; no process-related seepage impacts expected.

Operational phase – key contaminant sources

Low-grade ore stockpile (unlined in tributaries to the Haib River):

- Leachate with elevated aluminium and associated metals will infiltrate alluvial and upper fractured aquifers and migrate downgradient along tributary valleys, and seep into the pit.
- Seepage into the pit will be dewatered and retained within the mine water management system.
- Impact significance is rated MODERATE.

WRD (unlined in tributaries to the Haib River):

- Leachate with elevated aluminium and associated metals will infiltrate alluvial and upper fractured aquifers and migrate downgradient along tributary valleys.
- Leachate from the western side of the WRD will be drawn towards the pit. Leachate entering the pit will be dewatered and retained within the mine water management system.
- Seepage from the eastern portion of the WRD will migrate towards the Haib River east of the WRD and impact the water quality in the alluvial aquifer associated with the Haib River. Leachate from the WRD at 1.4 mg/L aluminium will mix with the relatively good quality water in the alluvials (aluminium concentration in the alluvials has been shown to be in the range of 0.0074 to 0.76 mg/L with an average of 0.04 mg/L).
- The aluminium concentration within the alluvials will remain below the Namibian Drinking Water Quality Guideline for “excellent” water of 0.15 mg/L. The plume is expected to migrate down gradient for 2.5 km to the where the tributary within which the off-channel water storage dam will be located joins the main Haib River channel. Over the 2.5 km migration path the element concentrations will further reduce due to mixing with the good quality water in the Haib River alluvials.
- It is expected that, under the assumption that there will be migration of good quality water from the storage dam via the alluvials into the Haib River alluvials, any elevated element concentrations migrating from the eastern WRD will be further diluted to a point where the plume cannot be distinguished anymore.
- The salt load contribution to the alluvial aquifer will only be during and directly after rainfall events. Depending on the annual rainfall, it is calculated that the aluminium salt load contribution to the alluvial aquifer is 21 to 136 kg aluminium per annum.

- Due to the low natural rainfall, there will be little contaminated leachate emanating from the WRD. This, combined with the potentially relatively large volume of water in the Haib River alluvials, results in a MODERATE impact on the water quality in the Haib River alluvials.

TSF (unlined, west of pit):

- Seepage with aluminium 2 mg/L will infiltrate into alluvial and fractured aquifers and migrate eastwards, reaching the Haib alluvial aquifer within 6 months to 1 year.
- The aluminium concentration is expected to increase over time and reach 0.45 mg/L by the end of life of the mine (year 24), and 0.55 mg/L by the end of the operational phase (year 34).
- The plume will also migrate towards the Haib River through the surface sand cover that exists to the north of the channel, and the upper fractured rock material that outcrops to the south of the channel. North of the channel the plume will reach the Haib River at around year 17 of the life of operations, and south of the channel the plume reaches the Haib River between years 24 and 25 of the life of operations. The contaminant plume will develop further, and the element concentrations entering the Haib River alluvials will increase over time to the end of the operational phase (year 34).
- The nearby Farm Borehole at the western edge of the TSF may be affected by seepage, with aluminium approaching source levels. The borehole is located on Haib Minerals-owned land and will not be used.
- Impact significance is MODERATE, due mainly to permanence and certainty of seepage rather than extensive or extreme degradation.

HLP (double-lined):

- Under proper design and operation, direct seepage to groundwater is not anticipated; impacts on groundwater quality are MODERATE.
- Downgradient monitoring is still recommended as an early-warning safeguard.

Open pit and dewatering:

- Oxidation of pit walls may locally degrade inflowing groundwater quality, but all inflows are captured and reused in the mine water circuit.
- The dewatering-induced drawdown cone will act as a hydraulic sink, capturing nearby contaminated groundwater and limiting off-site migration.
- Off-site groundwater quality impacts from pit-related processes are assessed as MODERATE.

Operational spills and runoff:

- Hydrocarbon and chemical releases from fuel handling, workshops and process areas pose a MODERATE risk, particularly in shallow alluvial aquifers.
- Risks are manageable through engineered containment, strict spill procedures and targeted monitoring.

Seepage from the off-channel water storage dam

- Recharge from the off-channel water storage dam will improve the groundwater quality underneath and downgradient of the dam. The zone of influence of the water quality improvement will be limited due to the short timeframe of the construction phase and the fact that the dam will only be filled towards the end of the construction phase, thereby further reducing the water holding time during the construction phase

Decommissioning and post-closure

Spills during decommissioning:

- Similar to construction risks, with MODERATE significance if not effectively managed, particularly in alluvial settings.

TSF, Low-grade Stockpile, and WRD – residual seepage:

- Following cessation of deposition, seepage volumes and contaminant concentrations will progressively decline as sources are flushed and, where implemented, capping reduces infiltration.
- Contaminant plumes are expected to stabilise and then slowly contract through limited recharge, dilution, dispersion and geochemical attenuation; the process will be slow in an arid climate.
- Due to the permanence and certainty of introduced contamination, the significance of WRD, low-grade stockpile, and TSF seepage impacts remains MODERATE in the long term, albeit with local spatial extent and moderate concentration increases relative to background.

Pit lake and long-term hydraulic control:

- The post-closure pit lake will stabilise below the regional water table, ensuring groundwater flow remains towards the pit.
- The pit will act as a long-term sink for surrounding groundwater and any nearby contaminants, effectively preventing decant and large-scale migration away from the pit.
- This is considered a MODERATE impact, beneficial regarding contaminant containment, contingent on maintaining pit levels below regional groundwater.

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11.0 CERTIFICATION

This report was prepared and reviewed by the undersigned.

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APPENDIX A – GROUNDWATER CHEMICAL ANALYSIS CERTIFICATES (FEBRUARY 2026)



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TEST REPORT I260345/1

To: Knight Piesold Consulting
P.O.Box 86062
Windhoek
Namibia

Date received: 11/Feb/26
Date analysed: 19 Feb - 6 Mar 2026
Date reported: 10/Mar/26

Attn: Lloyd Lynch
e-mail: llynch@knightpiesold.com
Tel: 061-307 297

Client Reference no.: Verbal
Quotation no.: QUA81986
Lab Reference: I260345
Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	Borhole 6
Date of sampling	2026
Test item number	I260345/1

Parameter	Value	Units	Acceptable Standard limits Human consumption	Livestock watering
p H	7.6		6-9	
Electrical Conductivity	156.8	mS/m	<300	
Turbidity	0.35	NTU	<2	
Total Dissolved Solids	1025	mg/l	<2000	6000
P-Alkalinity as CaCO ₃	<10	mg/l	-	
Total Alkalinity as CaCO ₃	175	mg/l	-	
Total Hardness as CaCO ₃	551	mg/l	<1000	
Ca-Hardness as CaCO ₃	419	mg/l	-	2500
Mg-Hardness as CaCO ₃	132	mg/l	-	2057
Chloride as Cl ⁻	161	mg/l	<300	1500-3000
Fluoride as F ⁻	1.4	mg/l	<1.5	2.0-6.0
Sulphate as SO ₄ ²⁻	422	mg/l	<300	1000
Nitrate as N	<0.5	mg/l	<11	100
Nitrite as N	<0.05	mg/l	<0.15	10
Sodium as Na	131	mg/l	<300	2000
Potassium as K	6.0	mg/l	<100	
Magnesium as Mg	32	mg/l	<70	500
Calcium as Ca	168	mg/l	<150	1000
Stability pH, at 25°C	7.0			
Langelier Index	0.6	scaling	>0=scaling, <0=corrosive, 0=stable	
Ryznar Index	6.5	scaling	<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable	
Corrosivity ratio	3.8	increasing corrosive tendency	Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 increasing corrosive tendency	


Approved Technical Signatory
Ms. Helena Daniel

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Tel: 061-307 297

Client Reference no.: Verbal

Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	Borhole 6
Date of sampling	2026
Test item number	I260345/1

Parameter	Value	Units	Acceptable Standard limits Human consumption
Ammonia nitrogen as N	0.20	mg/l	<0.50
Bromide as Br ⁻	<0.5	mg/l	<1.0
free Cyanide as CN ⁻	0.01	mg/l	<0.05
Beryllium as Be	<1.0	µg/l	<5
Boron as B	43	µg/l	<500
Cadmium as Cd	<1.0	µg/l	<10
Tin as Sn	<1.0	µg/l	<200
Antimony as Sb	<1.0	µg/l	<50
Barium as Ba	19	µg/l	<2000
Mercury as Hg	<1.0	µg/l	<2
Thallium as Tl	<1.0	µg/l	<10
Lead as Pb	<1.0	µg/l	<50
Bismuth as Bi	<1.0	µg/l	<500
Uranium as U	1.7	µg/l	<15
Aluminium as Al	14	µg/l	<100
Titanium as Ti	24	µg/l	<300
Vanadium as V	1.7	µg/l	<500
Chromium as Cr	1.5	µg/l	<100
Manganese as Mn	43	µg/l	<100
Iron as Fe	760	µg/l	<300
Cobalt as Co	<1.0	µg/l	<500
Nickel as Ni	<1.0	µg/l	<150
Copper as Cu	3.2	µg/l	<2000
Arsenic as As	1.9	µg/l	<50
Selenium as Se	2.7	µg/l	<50


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FM 7.8-4: Water Quality (SOC)

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To: **Knight Piesold Consulting**

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Date received: 11/Feb/26

Date analysed: 19 Feb - 6 Mar 2026

Date reported: 10/Mar/26

Attn: Lloyd Lynch

e-mail: llynch@knightpiesold.com

Tel: 061-307 297

Client Reference no.: Verbal

Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	Borehole 3
Date of sampling	2026
Test item number	I260345/2

Parameter	Value	Units	Acceptable Standard limits	
			Human consumption	Livestock watering
pH	7.3		6-9	
Electrical Conductivity	991	mS/m	<300	
Turbidity	0.35	NTU	<2	
Total Dissolved Solids	7048	mg/l	<2000	6000
P-Alkalinity as CaCO ₃	<10	mg/l	-	
Total Alkalinity as CaCO ₃	285	mg/l	-	
Total Hardness as CaCO ₃	1295	mg/l	<1000	
Ca-Hardness as CaCO ₃	866	mg/l	-	2500
Mg-Hardness as CaCO ₃	428	mg/l	-	2057
Chloride as Cl ⁻	1576	mg/l	<300	1500-3000
Fluoride as F ⁻	5.0	mg/l	<1.5	2.0-6.0
Sulphate as SO ₄ ²⁻	2147	mg/l	<300	1000
Nitrate as N	<0.5	mg/l	<11	100
Nitrite as N	<0.05	mg/l	<0.15	10
Sodium as Na	1486	mg/l	<300	2000
Potassium as K	28.0	mg/l	<100	
Magnesium as Mg	104	mg/l	<70	500
Calcium as Ca	347	mg/l	<150	1000
Stability pH, at 25°C	6.6			
Langelier Index	0.7	scaling	>0=scaling, <0=corrosive, 0=stable	
Ryznar Index	5.9	scaling	<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable	
Corrosivity ratio	15.7	increasing corrosive tendency	Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 Increasing corrosive tendency	


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Tel: 061-307 297

Client Reference no.: Verbal

Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	Borehole 3
Date of sampling	2026
Test item number	I260345/2

Parameter	Value	Units	Acceptable Standard limits
			Human consumption
Ammonia nitrogen as N	0.08	mg/l	<0.50
Bromide as Br ⁻	<0.5	mg/l	<1.0
free Cyanide as CN ⁻	0.05	mg/l	<0.05
Beryllium as Be	<1.0	µg/l	<5
Boron as B	<1.0	µg/l	<500
Cadmium as Cd	<1.0	µg/l	<10
Tin as Sn	1388	µg/l	<200
Antimony as Sb	<1.0	µg/l	<50
Barium as Ba	108	µg/l	<2000
Mercury as Hg	2.5	µg/l	<2
Thallium as Tl	<1.0	µg/l	<10
Lead as Pb	<1.0	µg/l	<50
Bismuth as Bi	<1.0	µg/l	<500
Uranium as U	28	µg/l	<15
Aluminium as Al	195	µg/l	<100
Titanium as Ti	11	µg/l	<300
Vanadium as V	27	µg/l	<500
Chromium as Cr	8.3	µg/l	<100
Manganese as Mn	69	µg/l	<100
Iron as Fe	1707	µg/l	<300
Cobalt as Co	1.1	µg/l	<500
Nickel as Ni	<1.0	µg/l	<150
Copper as Cu	19	µg/l	<2000
Arsenic as As	16	µg/l	<50
Selenium as Se	27	µg/l	<50


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Date received: 11/Feb/26

Date analysed: 19 Feb - 6 Mar 2026

Date reported: 10/Mar/26

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Tel: 061-307 297

Client Reference no.: Verbal

Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	HM04
Date of sampling	2026
Test item number	I260345/3

Parameter	Value	Units	Acceptable Standard limits	Livestock watering
			Human consumption	
pH	7.6		6-9	
Electrical Conductivity	92.4	mS/m	<300	
Turbidity	3.1	NTU	<2	
Total Dissolved Solids	541	mg/l	<2000	6000
P-Alkalinity as CaCO ₃	<10	mg/l	-	
Total Alkalinity as CaCO ₃	365	mg/l	-	
Total Hardness as CaCO ₃	132	mg/l	<1000	
Ca-Hardness as CaCO ₃	25	mg/l	-	2500
Mg-Hardness as CaCO ₃	107	mg/l	-	2057
Chloride as Cl ⁻	65	mg/l	<300	1500-3000
Fluoride as F ⁻	0.8	mg/l	<1.5	2.0-6.0
Sulphate as SO ₄ ²⁻	10	mg/l	<300	1000
Nitrate as N	<0.5	mg/l	<11	100
Nitrite as N	0.34	mg/l	<0.15	10
Sodium as Na	124	mg/l	<300	2000
Potassium as K	50	mg/l	<100	
Magnesium as Mg	26	mg/l	<70	500
Calcium as Ca	10	mg/l	<150	1000
Stability pH, at 25°C	7.9			
Langelier Index	-0.3	corrosive	>0=scaling, <0=corrosive, 0=stable	
Ryznar Index	8.2	corrosive	<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable	
Corrosivity ratio	0.3	increasing corrosive tendency	Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 increasing corrosive tendency	

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Ms. Helena Daniel

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FM 7.8-4: Water Quality (SOC)

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TEST REPORT I260345/3

To: **Knight Piesold Consulting**

P.O.Box 86062

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Namibia

Date received: 11/Feb/26

Date analysed: 19 Feb - 6 Mar 2026

Date reported: 10/Mar/26

Attn: Lloyd Lynch

e-mail: llynch@knightpiesold.com

Tel: 061-307 297

Client Reference no.: Verbal

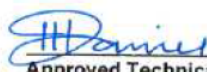
Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	HM04
Date of sampling	2026
Test item number	I260345/3

Parameter	Value	Units	Acceptable Standard limits
			Human consumption
Ammonia nitrogen as N	14	mg/l	<0.50
Bromide as Br ⁻	0.70	mg/l	<1.0
free Cyanide as CN ⁻	0.01	mg/l	<0.05
Beryllium as Be	<1.0	µg/l	<5
Boron as B	<1.0	µg/l	<500
Cadmium as Cd	<1.0	µg/l	<10
Tin as Sn	3.3	µg/l	<200
Antimony as Sb	<1.0	µg/l	<50
Barium as Ba	14	µg/l	<2000
Mercury as Hg	<1.0	µg/l	<2
Thallium as Tl	<1.0	µg/l	<10
Lead as Pb	1.6	µg/l	<50
Bismuth as Bi	<1.0	µg/l	<500
Uranium as U	<1.0	µg/l	<15
Aluminium as Al	53	µg/l	<100
Titanium as Ti	6.7	µg/l	<300
Vanadium as V	1.2	µg/l	<500
Chromium as Cr	7.6	µg/l	<100
Manganese as Mn	136	µg/l	<100
Iron as Fe	2925	µg/l	<300
Cobalt as Co	<1.0	µg/l	<500
Nickel as Ni	<1.0	µg/l	<150
Copper as Cu	28	µg/l	<2000
Arsenic as As	1.2	µg/l	<50
Selenium as Se	1.6	µg/l	<50


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TEST REPORT I260345/4

To: **Knight Piesold Consulting**
P.O.Box 86062
Windhoek
Namibia

Date received: 11/Feb/26
Date analysed: 19 Feb - 6 Mar 2026
Date reported: 10/Mar/26

Attn: Lloyd Lynch
e-mail: llynch@knightpiesold.com
Tel: 061-307 297

Client Reference no.: Verbal
Quotation no.: QUA81986
Lab Reference: I260345
Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	TCDH020
Date of sampling	2026
Test item number	I260345/4

Parameter	Value	Units	Acceptable Standard limits Human consumption	Livestock watering
pH	6.9		6-9	
Electrical Conductivity	65.4	mS/m	<300	
Turbidity	83.0	NTU	<2	
Total Dissolved Solids	423	mg/l	<2000	6000
P-Alkalinity as CaCO ₃	<10	mg/l	-	
Total Alkalinity as CaCO ₃	145	mg/l	-	
Total Hardness as CaCO ₃	272	mg/l	<1000	
Ca-Hardness as CaCO ₃	215	mg/l	-	2500
Mg-Hardness as CaCO ₃	58	mg/l	-	2057
Chloride as Cl ⁻	34	mg/l	<300	1500-3000
Fluoride as F ⁻	0.9	mg/l	<1.5	2.0-6.0
Sulphate as SO ₄ ²⁻	112	mg/l	<300	1000
Nitrate as N	20	mg/l	<11	100
Nitrite as N	0.18	mg/l	<0.15	10
Sodium as Na	43	mg/l	<300	2000
Potassium as K	7.8	mg/l	<100	
Magnesium as Mg	14	mg/l	<70	500
Calcium as Ca	86	mg/l	<150	1000
Stability pH, at 25°C	7.4			
Langelier Index	-0.5	corrosive	>0=scaling, <0=corrosive, 0=stable	
Ryznar Index	7.8	corrosive	<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable	
Corrosivity ratio	1.1	Increasing corrosive tendency	Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 Increasing corrosive tendency	


Approved Technical Signatory
Ms. Helena Daniel

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Date analysed: 19 Feb - 6 Mar 2026

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Attn: Lloyd Lynch

e-mail: llynch@knightpiesold.com

Tel: 061-307 297

Client Reference no.: Verbal

Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	TCDH020
Date of sampling	2026
Test item number	I260345/4

Parameter	Value	Units	Acceptable Standard limits
			Human consumption
Ammonia nitrogen as N	<0.02	mg/l	<0.50
Bromide as Br	<0.5	mg/l	<1.0
free Cyanide as CN ⁻	0.01	mg/l	<0.05
Beryllium as Be	<1.0	µg/l	<5
Boron as B	<1.0	µg/l	<500
Cadmium as Cd	<1.0	µg/l	<10
Tin as Sn	3.7	µg/l	<200
Antimony as Sb	1.4	µg/l	<50
Barium as Ba	49	µg/l	<2000
Mercury as Hg	<1.0	µg/l	<2
Thallium as Tl	<1.0	µg/l	<10
Lead as Pb	9.6	µg/l	<50
Bismuth as Bi	1.0	µg/l	<500
Uranium as U	<1.0	µg/l	<15
Aluminium as Al	1067	µg/l	<100
Titanium as Ti	49	µg/l	<300
Vanadium as V	5.7	µg/l	<500
Chromium as Cr	12	µg/l	<100
Manganese as Mn	564	µg/l	<100
Iron as Fe	10966	µg/l	<300
Cobalt as Co	5.6	µg/l	<500
Nickel as Ni	<1.0	µg/l	<150
Copper as Cu	193	µg/l	<2000
Arsenic as As	1.9	µg/l	<50
Selenium as Se	1.0	µg/l	<50


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Version 003

FM 7.8-4: Water Quality (SOC)

Effective Date: 01.10.2024

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TEST REPORT I260345/5

To: **Knight Piesold Consulting**

P.O.Box 86062

Windhoek

Namibia

Date received: 11/Feb/26

Date analysed: 19 Feb - 6 Mar 2026

Date reported: 10/Mar/26

Attn: Lloyd Lynch

e-mail: llynch@knightpiesold.com

Tel: 061-307 297

Client Reference no.: Verbal

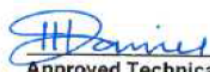
Quotation no.: QUA81986

Lab Reference: I260345

Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	GFMHB06
Date of sampling	2026
Test item number	I260345/5

Parameter	Value	Units	Acceptable Standard limits	Livestock watering
			Human consumption	
pH	6.7		6-9	
Electrical Conductivity	154.6	mS/m	<300	
Turbidity	59	NTU	<2	
Total Dissolved Solids	1404	mg/l	<2000	6000
P-Alkalinity as CaCO ₃	<10	mg/l	-	
Total Alkalinity as CaCO ₃	195	mg/l	-	
Total Hardness as CaCO ₃	920	mg/l	<1000	
Ca-Hardness as CaCO ₃	739	mg/l	-	2500
Mg-Hardness as CaCO ₃	181	mg/l	-	2057
Chloride as Cl ⁻	100	mg/l	<300	1500-3000
Fluoride as F ⁻	1.2	mg/l	<1.5	2.0-6.0
Sulphate as SO ₄ ²⁻	671	mg/l	<300	1000
Nitrate as N	1.8	mg/l	<11	100
Nitrite as N	<0.05	mg/l	<0.15	10
Sodium as Na	90	mg/l	<300	2000
Potassium as K	11	mg/l	<100	
Magnesium as Mg	44	mg/l	<70	500
Calcium as Ca	296	mg/l	<150	1000
Stability pH, at 25°C	6.8			
Langelier Index	-0.1	corrosive	>0=scaling, <0=corrosive, 0=stable	
Ryznar Index	6.8	stable	<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable	
Corrosivity ratio	4.3	increasing corrosive tendency	Applies to water in the pH range 7-8 which also contains dissolved oxygen ratios <0.2 no corrosive properties ratios >0.2 Increasing corrosive tendency	


Approved Technical Signatory
Ms. Helena Daniel

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TEST REPORT I260345/5

To: **Knight Piesold Consulting**
P.O.Box 86062
Windhoek
Namibia

Date received: 11/Feb/26
Date analysed: 19 Feb - 6 Mar 2026
Date reported: 10/Mar/26

Attn: Lloyd Lynch
e-mail: llynch@knightpiesold.com
Tel: 061-307 297

Client Reference no.: Verbal
Quotation no.: QUA81986
Lab Reference: I260345
Enquiries: Ms Helena P. Daniel

Sample details	Water
Location of sampling point	-
Description of sampling point	GFMHB06
Date of sampling	2026
Test item number	I260345/5

Parameter	Value	Units	Acceptable Standard limits Human consumption
Ammonia nitrogen as N	1.3	mg/l	<0.50
Bromide as Br ⁻	0.78	mg/l	<1.0
free Cyanide as CN ⁻	0.01	mg/l	<0.05
Beryllium as Be	<1.0	µg/l	<5
Boron as B	<1.0	µg/l	<500
Cadmium as Cd	<1.0	µg/l	<10
Tin as Sn	1.8	µg/l	<200
Antimony as Sb	<1.0	µg/l	<50
Barium as Ba	51	µg/l	<2000
Mercury as Hg	<1.0	µg/l	<2
Thallium as Tl	<1.0	µg/l	<10
Lead as Pb	5.6	µg/l	<50
Bismuth as Bi	<1.0	µg/l	<500
Uranium as U	<1.0	µg/l	<15
Aluminium as Al	187	µg/l	<100
Titanium as Ti	48	µg/l	<300
Vanadium as V	3.0	µg/l	<500
Chromium as Cr	4.6	µg/l	<100
Manganese as Mn	3915	µg/l	<100
Iron as Fe	7271	µg/l	<300
Cobalt as Co	5.4	µg/l	<500
Nickel as Ni	<1.0	µg/l	<150
Copper as Cu	107	µg/l	<2000
Arsenic as As	1.3	µg/l	<50
Selenium as Se	2.2	µg/l	<50


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Summary of test methods - Water Quality

Determinant	Unit	DL	Technique	Method reference
Absorbed oxygen	mg/l O ₂	2	titrimetric	SANS 5220:2005
Acidity	mg/l CaCO ₃	10	titrimetric	AWWA 2310 B
Alkalinity	mg/l CaCO ₃	10	titrimetric	AWWA 2320 B
Ammonium	mg/l N	0.02	colorimetric	AWWA 4500-NH ₃ F / modified Berthelot
Bicarbonate & Carbonate	mg/l CaCO ₃	1	by calculation	
Biological oxygen demand, 5-day	mg/l O ₂	2	electrometric	AWWA 5210 B
Biological oxygen demand, carbonaceous	mg/l O ₂	2	electrometric	AWWA 5210 B
Bromide & Iodide	mg/l Br ⁻	0.05	iodometric	P. Höfer
Chloride	mg/l Cl ⁻	1	argentometric	AWWA 4500-Cl ⁻ B
Chlorine, free and total	mg/l Cl ₂	0.05	colorimetric	AWWA 4500-Cl G
Chlorophyll a	µg/L	0.01	spectrophotometric	ISO 10260:1992 E
Chemical oxygen demand	mg/l O ₂	1	colorimetric	AWWA 5220 D
Colour	Pt	10	colorimetric	AWWA Pt-Co-2120 B
Cyanide	mg/l CN	0.02	colorimetric	AWWA 4500-CN E
Density	mg/l g/ml	-	gravimetric	METH W 016
Dissolved oxygen	mg/l O ₂	0.1	electrometric	AWWA 4550-O G
Electrical conductivity	mS/m	0.1	electrometric	AWWA 2510 B
Fat, oil & grease	mg/l	2	extraction/gravimetric	AWWA 5520 B
Fixed and volatile solids, Ignited at 550°C	mg/l	1	gravimetric	AWWA 2540 E
Fluoride	mg/l F ⁻	0.1	electrometric	AWWA 4500-F C
Hardness	mg/l CaCO ₃	1	by calculation	AWWA 2340 B
Hexavalent chromium	mg/l Cr	0.01	colorimetric	AWWA 3500-Cr B
Hydrolysable phosphates	mg/l P	0.01	digestion, PO ₄	AWWA 4500-P B.2 + E
Kjeldahl nitrogen	mg/l N	0.5	by calculation	
Molybdosilicate	mg/l SiO ₂	0.4	colorimetric	AWWA 4500-Si C
Nitrate	mg/l N	0.5	colorimetric	Spectroquant / AWWA 4500-NO ₃ E
Nitrite	mg/l N	0.01	colorimetric	AWWA 4500-NO ₂ B
Oxidation reduction potential (Redox)	mV	-	electrometric	AWWA 2580 B
pH		-	electrometric	AWWA 4500-H ⁺ B
Phenols	mg/l Phenol	0.05	colorimetric	ASTM D1783-01, B
Reactive phosphorous	mg/l PO ₄	0.03	colorimetric	AWWA 4500-P E
Settable solids	mg/l	1	gravimetric	AWWA 2540 F
Sulfide	mg/l S ²⁻	0.05	colorimetric	AWWA 4500-S ²⁻ D
Sulfite	mg/l SO ₃ ²⁻	2	iodometric	AWWA 4500-SO ₃ ²⁻ B
Sulphate	mg/l SO ₄	1	nephelometric / colorimetric	AWWA 4500-SO ₄ E / F
Total dissolved solids	mg/l	1	gravimetric	AWWA 2540 C
Total nitrogen	mg/l N	0.5	digestion, NO ₃	EN ISO 11905-1:1997
Total phosphorous	mg/l P	0.01	digestion, PO ₄	AWWA 4500-P B.5 + E
Total solids	mg/l	1	gravimetric	AWWA 2540 B
Total suspended solids	mg/l	1	gravimetric	AWWA 2540 D
Turbidity	NTU	0.05	nephelometric	AWWA 2130 B
UV absorbing organic constituents at 254nm	cm ⁻¹	-	colorimetric	AWWA 5910 B
Aluminium	mg/l Al	0.01	ICP-OES	AWWA ICP-3500-Al C
Antimony	mg/l Sb	0.01	ICP-OES	AWWA ICP-3500-Sb C
Arsenic	mg/l As	0.01	ICP-OES	AWWA ICP-3500-As D
Barium	mg/l Ba	0.01	ICP-OES	AWWA ICP-3500-Ba C
Beryllium	mg/l Be	0.01	ICP-OES	AWWA ICP-3500-Be
Bismuth	mg/l Bi	0.01	ICP-OES	AWWA ICP-3500-Bi
Boron	mg/l B	0.01	ICP-OES	AWWA ICP-3500-B
Cadmium	mg/l Cd	0.01	ICP-OES	AWWA ICP-3500-Cd C

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Version 003

FM 7.8-4: Water Quality (SOC)

Effective Date: 01.10.2024

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Calcium	mg/l Ca	0.1	ICP-OES	AWWA ICP-3500-Ca C
Chromium (total)	mg/l Cr	0.01	ICP-OES	AWWA ICP-3500-Cr C
Cobalt	mg/l Co	0.01	ICP-OES	AWWA ICP-3500-Co C
Copper	mg/l Cu	0.01	ICP-OES	AWWA ICP-3500-Cu C
Gold	mg/l Au	0.01	ICP-OES	AWWA ICP-3500-Au
Iron	mg/l Fe	0.01	ICP-OES	AWWA ICP-3500-Fe C
Lead	mg/l Pb	0.01	ICP-OES	AWWA ICP-3500-Pb C
Lithium	mg/l Li	0.01	ICP-OES	AWWA ICP-3500-Li C
Magnesium	mg/l Mg	0.1	ICP-OES	AWWA ICP-3500-Mg C
Manganese	mg/l Mn	0.01	ICP-OES	AWWA ICP-3500-Mn C
Mercury	mg/l Hg	0.01	ICP-OES	AWWA ICP-3500-Hg
Molybdenum	mg/l Mo	0.01	ICP-OES	AWWA ICP-3500-Mo C
Nickel	mg/l Ni	0.01	ICP-OES	AWWA ICP-3500-Ni C
Potassium	mg/l K	0.1	ICP-OES	AWWA ICP-3500-K C
Rubidium	mg/l Rb	0.01	ICP-OES	ICP-OES
Selenium	mg/l Se	0.01	ICP-OES	AWWA ICP-3500-Se I
Silica	mg/l Si	0.01	ICP-OES	ICP-OES
Silver	mg/l Ag	0.01	ICP-OES	AWWA ICP-3500-Ag
Sodium	mg/l Na	0.1	ICP-OES	AWWA ICP-3500-Na C
Strontium	mg/l Sr	0.01	ICP-OES	AWWA ICP-3500-Sr C
Thallium	mg/l Th	0.01	ICP-OES	AWWA ICP-3500-Tl C
Tellurium	mg/l Te	0.01	ICP-OES	AWWA ICP-3500-Te
Tin	mg/l Sn	0.01	ICP-OES	AWWA ICP-3500-Sn
Titanium	mg/l Ti	0.01	ICP-OES	AWWA ICP-3500-Ti
Uranium	mg/l U	0.01	ICP-OES	AWWA ICP-3500-U
Vanadium	mg/l V	0.01	ICP-OES	AWWA ICP-3500-V C
Zinc	mg/l Zn	0.01	ICP-OES	AWWA ICP-3500-Zn C

Lower reporting limit

These are estimated values only; accurate lower levels of detection (LLDs) (measurement as part of a method) and method detection levels (MDLs) (measurement for the whole method) still have to be established
Given the varied matrices submitted to the laboratory and divers quality needs method and/or reagent blanks, performance evaluation samples and duplicate results may be included to assist in appropriate use of laboratory data.

All submitted samples are initially run undiluted unless sample dilutions are required in order to reduce or eliminate known matrix / interference effects. When an analyte concentration exceeds the calibration or linear range, the sample is re-analysed after appropriate dilution. The analyst will use the least dilution necessary to bring the analyte within the range. In both cases, a loss of sensitivity is experienced. All sample dilutions result in an increase in the lower reporting limit by a factor equal to the dilution. The less than symbol "<" is used for qualified data below the lower reporting limit.

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APPENDIX B – GEOCHEMICAL ANALYSIS CERTIFICATES



TEST REPORT

Contact	Diana Duthe	Project Number	WI301-00906/05
Client	Knight Piesold	Lab Reference	JBX25-023738
Email	dduthe@knightpiesold.com	Report Number	LIM25/1218
Address		Date Received	25-Apr-2025
Order Number		Date Test(s) Started	25-Apr-2025
Samples	14	Date Reported	30-May-2025
Sample Matrix	Geochem		

The document is issued in accordance with SANAS's accreditation requirements. Accredited for compliance with ISO/IEC 17025. SANAS accredited laboratory T0775. Results marked "Subcontracted Test" in this report are not included in the SANAS Scope of Accreditation for this laboratory.



Sample No.			JBX25-023738-01	JBX25-023738-02	JBX25-023738-03	JBX25-023738-04
Sample ID			HAIB-HM12	HAIB-HM22/1	HAIB-HM24	HAIB-HM28/1
Sample Comment			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Paste pH (ME-AN-024) - LAB-QLT-MET-024						
Paste pH	-	-	9.3	9.4	9.4	9.6
Modified acid base accounting (ME-AN-025) - LAB-QLT-MET-025						
NP as kg CaCO ₃ /T	kg CaCO ₃ /T	-	20	11	6.5	21
Classification *	-	-	PAG	U	U	U
Fizz Rating	-	-	1	0	0	1
Acid Potential *	Kg CaCO ₃ /T	0.31	40	4.9	1.7	15
Net Neutralising Potential *	Kg CaCO ₃ /T	-	-19	6.5	4.9	5.2
NP AP Ratio *	-	-	0.51	2.3	3.9	1.3
Sulphur and Carbon Species (Subcontracted) - -						
Total Sulphur as S *	%	0.01	1.3	0.20	0.07	0.52
Sulphide as S *	%	0.01	1.3	0.16	0.05	0.49
Total Carbon as C *	%	0.01	0.28	0.07	0.03	0.19
Carbonate as CO ₃ *	%	0.01	1.1	0.29	0.07	0.88
Organic Carbon as C *	%	0.01	0.05	0.01	0.01	0.02
Inorganic Carbon as C *	%	0.01	0.23	0.06	0.01	0.18
2 endpoint static net acid generation (nag) (ME-AN-028) - LAB-QLT-MET-028						
NAG pH *		0.1	3.5	6.9	7.0	6.3
NAG as kg H2SO4/tonne at pH 4.5 *		0.5	2.4	<0.5	<0.5	<0.5
NAG as kg H2SO4/tonne at pH 7.0 *	kg H2SO4/T	0.5	6.7	<0.5	<0.5	0.6
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027						
Antimony	mg/kg	2	<2	<2	<2	<2
Arsenic	mg/kg	1	<1	<1	<1	<1

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

Samples analysed as received. Solid samples expressed on a dry weight basis. Unless otherwise indicated, samples were received in containers fit for purpose at ambient temperature. This document is issued by the Company under its General Conditions of Service. Attention is drawn to the limitation of liability, and jurisdiction issues defined therein. WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) draw and/ or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativity of all goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. The document is issued in accordance with SANAS's accreditation requirements and shall not be reproduced, except in full, without written approval of the laboratory.



TEST REPORT

Report number
Client reference: 23738

Sample No.	Sample ID	Sample Comment	JBX25-023738-01	JBX25-023738-02	JBX25-023738-03	JBX25-023738-04
			HAIB-HM12	HAIB-HM22/1	HAIB-HM24	HAIB-HM28/1
			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027						
Barium	mg/kg	0.2	190	62	62	58
Boron	mg/kg	0.5	14	3.9	4.0	5.1
Cadmium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/kg	50	6600	7500	4400	12000
Chromium	mg/kg	0.2	3.6	8.4	8.0	25
Cobalt	mg/kg	0.5	10	9.7	6.3	20
Copper	mg/kg	2	4521	1087	927	2893
Lead	mg/kg	1	5	5	4	5
Magnesium	mg/kg	1	4789	8593	5663	18038
Manganese	mg/kg	1	281	302	244	640
Molybdenum	mg/kg	0.5	220	17	2.7	18
Nickel	mg/kg	0.5	11	15	11	32
Potassium	mg/kg	20	4034	7813	3856	6787
Selenium	mg/kg	1	<1	<1	<1	<1
Sodium	mg/kg	50	336	878	705	403
Vanadium	mg/kg	0.1	8.8	49	24	44
Zinc	mg/kg	1	55	49	42	111
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068						
Mercury	µg/kg	0.1	55	44	57	41
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014						
Fluoride as F	mg/Kg	0.5	3.4	3.3	5.0	5.0
Sulphur and Carbon Species (Subcontracted) - -						
Sulphate as SO ₄ *	%	0.01	0.12	0.11	0.05	0.09
Subcontract - Subcontract						
XRD *	-	0.1	X-Lab25-3	X-Lab25-3	X-Lab25-3	X-Lab25-3

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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X Lab Earth Science PTY LTD
2 Samantha Street, Strydom Park, Randburg, 2169
Telephone Number: 011 590 3000
Email: info@xlab.co.za

TEST REPORT

Report number
Client reference: 23738

Sample No.	Sample ID	Sample Comment	JBX25-023738-01	JBX25-023738-02	JBX25-023738-03	JBX25-023738-04
			HAIB-HM12	HAIB-HM22/1	HAIB-HM24	HAIB-HM28/1
			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014						
Chloride *	mg/kg	5	5.3	9.0	11	6.1
Nitrate *	mg/kg	5	<5	<5	<5	<5
Sulphate *	mg/kg	5	130	360	49	56
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011						
TDS (0.7µm) @ 105°C *	mg/kg	21	846	1115	1656	882
Sample No.	Sample ID	Sample Comment	JBX25-023738-05	JBX25-023738-06	JBX25-023738-07	JBX25-023738-08
			HAIB-HM28/2	HAIB-HM31R	HAIB-HM33	HAIB-HM42/1
			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Paste pH (ME-AN-024) - LAB-QLT-MET-024						
Paste pH	-	-	10.0	9.2	9.8	9.3
Modified acid base accounting (ME-AN-025) - LAB-QLT-MET-025						
NP as kg CaCO ₃ /T	kg CaCO ₃ /T	-	29	6.9	25	7.6
Classification *	-	-	PAN	PAN	U	PAN
Fizz Rating	-	-	2	0	2	0
Acid Potential *	Kg CaCO ₃ /T	0.31	4.3	<0.31	8.5	<0.31
Net Neutralising Potential *	Kg CaCO ₃ /T	-	25	6.8	16	7.5
NP AP Ratio *	-	-	6.7	220	2.9	120
Sulphur and Carbon Species (Subcontracted) - -						
Total Sulphur as S *	%	0.01	0.17	0.02	0.30	0.02
Sulphide as S *	%	0.01	0.14	<0.01	0.27	<0.01
Total Carbon as C *	%	0.01	0.31	0.02	0.30	0.04
Carbonate as CO ₃ *	%	0.01	1.5	0.05	1.4	0.11
Organic Carbon as C *	%	0.01	0.01	0.02	0.01	0.02
Inorganic Carbon as C *	%	0.01	0.30	0.01	0.28	0.02
2 endpoint static net acid generation (nag) (ME-AN-026) - LAB-QLT-MET-026						
NAG pH *		0.1	7.2	7.4	6.4	7.5
NAG as kg H ₂ SO ₄ /tonne at pH 4.5 *		0.5	<0.5	<0.5	<0.5	<0.5
NAG as kg H ₂ SO ₄ /tonne at pH 7.0 *	kg H ₂ SO ₄ /T	0.5	<0.5	<0.5	0.6	<0.5
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027						
Antimony	mg/kg	2	<2	<2	<2	<2

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Koryx Copper Inc(Pty) Ltd
PROPOSED MINING ACTIVITIES FOR THE HAIB MINE
HYDROGEOLOGICAL PFS SPECIALIST ASSESSMENT



TEST REPORT

X Lab Earth Science PTY LTD
2 Samantha Street, Strydom Park, Randburg, 2169
Telephone Number: 011 590 3000
Email: info@xlab.co.za

Report number
Client reference: 23738

Sample No.	Sample ID	Sample Comment	JBX25-023738-05	JBX25-023738-06	JBX25-023738-07	JBX25-023738-08
			HAIB-HM28/2	HAIB-HM31R	HAIB-HM33	HAIB-HM42/1
			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027						
Arsenic	mg/kg	1	<1	<1	<1	<1
Barium	mg/kg	0.2	81	39	35	53
Boron	mg/kg	0.5	3.9	8.6	5.3	4.9
Cadmium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/kg	50	19000	4400	11000	5500
Chromium	mg/kg	0.2	35	13	6.4	9.9
Cobalt	mg/kg	0.5	18	10	7.4	9.0
Copper	mg/kg	2	1229	2867	2085	1723
Lead	mg/kg	1	8	29	6	5
Magnesium	mg/kg	1	16506	10272	5812	8548
Manganese	mg/kg	1	852	293	291	296
Molybdenum	mg/kg	0.5	2.0	67	41	1.4
Nickel	mg/kg	0.5	31	18	10	23
Potassium	mg/kg	20	10634	3469	3869	3707
Selenium	mg/kg	1	<1	<1	<1	<1
Sodium	mg/kg	50	563	575	658	692
Vanadium	mg/kg	0.1	57	42	20	38
Zinc	mg/kg	1	97	68	59	54
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068						
Mercury	µg/kg	0.1	44	25	38	47
Determination of inorganic Ions by IC (ME-AN-014) - LAB-QLT-MET-014						
Fluoride as F	mg/Kg	0.5	3.8	21	9.8	11
Sulphur and Carbon Species (Subcontracted) - -						
Sulphate as SO ₄ *	%	0.01	0.10	0.05	0.09	0.05

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TEST REPORT

Report number
Client reference: 23738

Sample No.	Sample ID	Sample Comment	JBX25-023738-05	JBX25-023738-06	JBX25-023738-07	JBX25-023738-08
			HAIB-HM28/2	HAIB-HM31R	HAIB-HM33	HAIB-HM42/1
			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Subcontract - Subcontract						
XRD *	-	0.1	X-Lab25-3	X-Lab25-3	X-Lab25-3	X-Lab25-3
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014						
Chloride *	mg/kg	5	6.7	12	9.8	9.8
Nitrate *	mg/kg	5	<5	<5	<5	<5
Sulphate *	mg/kg	5	76	36	51	70
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011						
TDS (0.7µm) @ 105°C *	mg/kg	21	1026	1116	1296	1494
Sample No.	Sample ID	Sample Comment	JBX25-023738-09	JBX25-023738-10	JBX25-023738-11	JBX25-023738-12
			HAIB-HM42/2	HAIB-HM42/3	HAIB-HM42/4	HAIB-HM22/2
			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Paste pH (ME-AN-024) - LAB-QLT-MET-024						
Paste pH	-	-	9.4	9.2	8.6	10
Modified acid base accounting (ME-AN-025) - LAB-QLT-MET-025						
NP as kg CaCO ₃ /T	kg CaCO ₃ /T	-	16	8.6	6.6	9.8
Classification *	-	-	U	PAG	PAN	U
Fizz Rating	-	-	1	0	0	0
Acid Potential *	Kg CaCO ₃ /T	0.31	3.2	100	<0.31	5.3
Net Neutralising Potential *	Kg CaCO ₃ /T	-	13	-93	6.6	4.6
NP AP Ratio *	-	-	4.9	0.09	210	1.9
Sulphur and Carbon Species (Subcontracted) --						
Total Sulphur as S *	%	0.01	0.13	3.3	0.03	0.19
Sulphide as S *	%	0.01	0.10	3.2	<0.01	0.17
Total Carbon as C *	%	0.01	0.15	0.08	0.06	0.06
Carbonate as CO ₃ *	%	0.01	0.70	0.35	0.24	0.24
Organic Carbon as C *	%	0.01	0.01	0.01	0.01	0.01
Inorganic Carbon as C *	%	0.01	0.14	0.07	0.05	0.05
2 endpoint static net acid generation (nag) (ME-AN-028) - LAB-QLT-MET-028						
NAG pH *		0.1	7.2	2.6	7.1	6.6
NAG as kg H ₂ SO ₄ /tonne at pH 4.5 *		0.5	<0.5	21	<0.5	<0.5
NAG as kg H ₂ SO ₄ /tonne at pH 7.0 *	kg H ₂ SO ₄ /T	0.5	<0.5	19	<0.5	0.8

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UTD Unable to determine
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TEST REPORT

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Sample No.			JBX25-023738-09	JBX25-023738-10	JBX25-023738-11	JBX25-023738-12
Sample ID			HAIB-HM42/2	HAIB-HM42/3	HAIB-HM42/4	HAIB-HM22/2
Sample Comment			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027						
Antimony	mg/kg	2	<2	<2	<2	<2
Arsenic	mg/kg	1	<1	<1	<1	<1
Barium	mg/kg	0.2	150	42	64	59
Boron	mg/kg	0.5	7.0	8.7	5.0	4.2
Cadmium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/kg	50	8300	4100	4400	7300
Chromium	mg/kg	0.2	9.5	5.7	7.9	8.3
Cobalt	mg/kg	0.5	11	8.5	10.0	9.7
Copper	mg/kg	2	1096	7464	749	984
Lead	mg/kg	1	4	118	19	4
Magnesium	mg/kg	1	9029	3809	4861	7692
Manganese	mg/kg	1	300	170	229	270
Molybdenum	mg/kg	0.5	1.3	130	24	0.9
Nickel	mg/kg	0.5	14	12	14	12
Potassium	mg/kg	20	5404	4377	3868	5066
Selenium	mg/kg	1	<1	<1	<1	<1
Sodium	mg/kg	50	810	430	393	777
Vanadium	mg/kg	0.1	41	13	38	41
Zinc	mg/kg	1	49	89	35	41
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068						
Mercury	µg/kg	0.1	60	28	30	40
Determination of inorganic Ions by IC (ME-AN-014) - LAB-QLT-MET-014						
Fluoride as F	mg/Kg	0.5	8.8	7.2	7.0	7.1

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TEST REPORT

Report number
Client reference: 23738

Sample No.			JBX25-023738-09	JBX25-023738-10	JBX25-023738-11	JBX25-023738-12
Sample ID			HAIB-HM42/2	HAIB-HM42/3	HAIB-HM42/4	HAIB-HM22/2
Sample Comment			-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result
Sulphur and Carbon Species (Subcontracted) - -						
Sulphate as SO ₄ *	%	0.01	0.09	0.10	0.08	0.06
Subcontract - Subcontract						
XRD *	-	0.1	X-Lab25-3	X-Lab25-3	X-Lab25-3	X-Lab25-3
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014						
Chloride *	mg/kg	5	7.9	7.7	24	10
Nitrate *	mg/kg	5	<5	<5	8.9	<5
Sulphate *	mg/kg	5	150	200	42	29
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011						
TDS (0.7µm) @ 105°C *	mg/kg	21	1098	989	972	1403

Sample No.			JBX25-023738-13	JBX25-023738-14
Sample ID			HAIB-HM22/3A	HAIB-HM22/3B
Sample Comment			-	-
Analysis	Unit	LOR	Result	Result
Paste pH (ME-AN-024) - LAB-QLT-MET-024				
Paste pH	-	-	9.5	9.8
Modified acid base accounting (ME-AN-025) - LAB-QLT-MET-025				
NP as kg CaCO ₃ /T	kg CaCO ₃ /T	-	15	13
Classification *	-	-	PAN	PAN
Fizz Rating	-	-	0	0
Acid Potential *	Kg CaCO ₃ /T	0.31	1.8	2.1
Net Neutralising Potential *	Kg CaCO ₃ /T	-	13	11
NP AP Ratio *	-	-	8.5	6.5
Sulphur and Carbon Species (Subcontracted) - -				
Total Sulphur as S *	%	0.01	0.10	0.10
Sulphide as S *	%	0.01	0.06	0.07
Total Carbon as C *	%	0.01	0.15	0.11
Carbonate as CO ₃ *	%	0.01	0.68	0.49
Organic Carbon as C *	%	0.01	0.01	0.01
Inorganic Carbon as C *	%	0.01	0.14	0.10
2 endpoint static net acid generation (nag) (ME-AN-028) - LAB-QLT-MET-028				
NAG pH *		0.1	6.9	6.9
NAG as kg H ₂ SO ₄ /tonne at pH 4.5 *		0.5	<0.5	<0.5

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TEST REPORT

Report number
Client reference: 23738

Sample No.	JBX25-023738-13		JBX25-023738-14	
Sample ID	HAIB-HM22/3A		HAIB-HM22/3B	
Sample Comment	-		-	
Analysis	Unit	LOR	Result	Result
2 endpoint static net acid generation (nag) (ME-AN-028) - LAB-QLT-MET-028				
NAG as kg H ₂ SO ₄ /tonne at pH 7.0 *	kg H ₂ SO ₄ /T	0.5	<0.5	<0.5
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027				
Antimony	mg/kg	2	<2	<2
Arsenic	mg/kg	1	<1	<1
Barium	mg/kg	0.2	250	170
Boron	mg/kg	0.5	5.5	3.5
Cadmium	mg/kg	0.1	<0.1	<0.1
Calcium	mg/kg	50	6900	7200
Chromium	mg/kg	0.2	9.1	9.9
Cobalt	mg/kg	0.5	8.8	12
Copper	mg/kg	2	765	759
Lead	mg/kg	1	3	3
Magnesium	mg/kg	1	9896	10863
Manganese	mg/kg	1	361	372
Molybdenum	mg/kg	0.5	58	12
Nickel	mg/kg	0.5	17	19
Potassium	mg/kg	20	9557	10422
Selenium	mg/kg	1	<1	<1
Sodium	mg/kg	50	887	1008
Vanadium	mg/kg	0.1	54	61
Zinc	mg/kg	1	48	53
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068				
Mercury	µg/kg	0.1	34	32

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TEST REPORT

Report number
Client reference: 23738

Sample No.	JBX25-023738-13		JBX25-023738-14	
Sample ID	HAIB-HM22/3A		HAIB-HM22/3B	
Sample Comment	-		-	
Analysis	Unit	LOR	Result	Result
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014				
Fluoride as F	mg/Kg	0.5	3.6	4.8
Chloride *	mg/kg	5	<5	5.4
Nitrate *	mg/kg	5	<5	<5
Sulphate *	mg/kg	5	360	350
Sulphur and Carbon Species (Subcontracted) --				
Sulphate as SO ₄ *	%	0.01	0.12	0.11
Subcontract - Subcontract				
XRD *	-	0.1	X-Lab25-3	X-Lab25-3
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011				
TDS (0.7µm) @ 105°C *	mg/kg	21	1313	1710

Sasha Maistry
Technical Signatory (Approver)

Sarah Newton
Technical Signatory (Reviewer)

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Koryx Copper Inc(Pty) Ltd
PROPOSED MINING ACTIVITIES FOR THE HAIB MINE
HYDROGEOLOGICAL PFS SPECIALIST ASSESSMENT

Method	Method Summary
Paste pH (ME-AN-024)	Paste pH is determined by mixing a portion of sample with water at a low liquid to solid ratio and measuring the pH of the resulting paste. Based on MEND 1.16.1
Modified acid base accounting (ME-AN-025)	The modified Sobek neutralising potential (NP) is determined by treating a portion of the sample with excess HCl over 24 hours. The unconsumed acid is titrated with NaOH. The calcium carbonate (CaCO ₃) equivalent is then calculated. This method is based on MEND 1.16.1. Total sulphur, sulphide, sulphate, total carbon, carbonate, inorganic and organic carbon are determined by combustion infra-red spectrometry and calculation. The testing is subcontracted. Acid potential, net neutralising potential and the ratio of neutralising potential to acid potential are calculated. The waste is classified w.r.t acid generation or neutralisation potential based on these results. Based on Mend 1.20.1
Sulphur and Carbon Species (Subcontracted)	Total sulphur, sulphide, sulphate, total carbon, carbonate, inorganic and organic carbon are determined by combustion infra-red spectrometry and calculation. The testing is subcontracted.
2 endpoint static net acid generation (nag) (ME-AN-028)	A portion of the sample is reacted overnight with hydrogen peroxide. After boiling to remove excess peroxide the sample is titrated first to pH 7 and then to pH 4.5. Based on Amira P387-A
Multi Element Determination of Metals by ICP OES (ME-AN-027)	Dissolved metals are determined on a filtered and acidified portion of aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.7 and Standard Methods for the Examination of Water and Wastewater Method 3120. Total metals are determined on a nitric acid digested portion of well-shaken aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2 and 200.7. Recoverable metals are determined on an acid digested portion of sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2, 3050B and 200.7. Silicon is not recovered. Metals are determined on acid digestions of filters by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on NIOSH 7300 and 7301.
Determination of Hg by CVAAS (ME-AN-068)	Mercury in aqueous solution is analysed by Cold Vapour Atomic Absorption Spectrometry (CV-AAS). The method is based on US EPA 245.7. Digestions of soils, wastes, filters and air monitoring samples are variously based on US EPA 200.2, 3050B, and Method 29 and EN 13211.
Determination of inorganic ions by IC (ME-AN-014)	Inorganic anions (Br, Cl, F, NO ₃ , NO ₂ , SO ₄) are determined on aqueous samples by ion chromatography (IC). The method is based on Standard Methods for the Examination of Water and Wastewater Method 4110 B. For soils and wastes anions are measured on 10:1 water extracts. Sulphate, nitrite, fluoride and chloride are determined on sorbent extracts by ion chromatography (IC) and the required pollutant concentration obtained by calculation. The method is based on radiello® methods F1, J1 and K1
Subcontract	This test has been subcontracted. Methodology not specified.
Determination of TDS (ME-AN-011)	Total dissolved solids (TDS) is determined gravimetrically on a filtered aliquot of aqueous sample at 105 °C. The method is based on Standard Methods for the Examination of Water and Wastewater 2540 C.

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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End of Report

Page 10 of 10



X Lab Earth Science PTY LTD
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Email: info@xlab.co.za

TEST REPORT

Contact	Diana Duthe	Project Number	WI301-00906/05
Client	Knight Piesold	Lab Reference	JBX25-023757
Email	dduthe@knightpiesold.com	Report Number	LIM25/1237
Address		Date Received	29-Apr-2025
Order Number		Date Test(s) Started	29-Apr-2025
Samples	15	Date Reported	29-May-2025
Sample Matrix	Leach		

The document is issued in accordance with SANAS's accreditation requirements. Accredited for compliance with ISO/IEC 17025. SANAS accredited laboratory T0775. Results marked "Subcontracted Test" in this report are not included in the SANAS Scope of Accreditation for this laboratory.



Sample No.			JBX25-023757-01	JBX25-023757-02	JBX25-023757-03	JBX25-023757-04	JBX25-023757-05
Sample ID			HAIB-HM12	HAIB-HM22/1	HAIB-HM24	HAIB-HM28/1	HAIB-HM28/2
Sample Comment			-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result	Result
Australian Standard Leaching Procedure - ASLP							
Leaching Solution *	-	-	ASLP LEACH	ASLP LEACH	ASLP LEACH	ASLP LEACH	ASLP LEACH
Final pH *	-	1.0	9.6	9.7	9.4	9.7	9.8
Determination of Electrical Conductivity (ME-AN-007) - LAB-QLT-MET-007							
Conductivity in mS/m 25°C	mS/m	2	7.2	8.2	3.7	6.2	6.5
Determination of Alkalinity (ME-AN-001) - LAB-QLT-MET-001							
Total Alkalinity as CaCO ₃	mg/L	12	45	25	30	40	40
Carbonate Alkalinity as CO ₃	mg/L	12	24	<12	18	18	18
Bicarbonate Alkalinity as CaCO ₃	mg/L	12	<12	15	<12	<12	<12
(P) Alkalinity as CaCO ₃	mg/L	12	20	<12	15	15	25
(M) Alkalinity as CaCO ₃	mg/L	12	25	20	15	25	15
Bicarbonate as CaCO ₃	mg/L	12	<12	15	<12	<12	<12
Bicarbonate Alkalinity as HCO ₃	mg/L	12	<12	18	<12	12	<12
Carbonate Alkalinity as CaCO ₃	mg/L	12	40	<12	30	30	30
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014							
Chloride	mg/L	0.05	0.20	0.11	0.21	0.17	0.19

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TEST REPORT

Report number
Client reference: 23757

Sample No.	JBX25-023757-01		JBX25-023757-02		JBX25-023757-03		JBX25-023757-04		JBX25-023757-05	
Sample ID	HAIB-HM12		HAIB-HM22/1		HAIB-HM24		HAIB-HM28/1		HAIB-HM28/2	
Sample Comment										
Analysis	Unit	LOR	Result	Result	Result	Result	Result	Result	Result	
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014										
Fluoride	mg/L	0.05	0.23	0.17	0.16	0.21	0.15			
Nitrate as NO ₃	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Nitrate as N	mg/L	0.03	<0.03	<0.03	<0.03	<0.03	<0.03			
Sulphate	mg/L	0.05	5.2	13	2.0	1.7	2.3			
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011										
TDS (0.7µm) @ 105°C	mg/L	21	120	56	110	130	78			
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027										
Aluminium (Al)	mg/L	0.02	1.1	1.1	1.2	2.7	1.5			
Antimony (Sb)	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Arsenic (As)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Barium (Ba)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002			
Boron (B)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005			
Cadmium (Cd)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Calcium (Ca)	mg/L	0.5	6.3	7.9	2.3	6.4	5.8			
Chromium (Cr)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002			

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
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NA Not analysed
- Not applicable
UTD Unable to determine
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TEST REPORT

Report number

Client reference: 23757

Sample No.	Sample ID	Sample Comment	JBX25-023757-01	JBX25-023757-02	JBX25-023757-03	JBX25-023757-04	JBX25-023757-05
			HAIB-HM12	HAIB-HM22/1	HAIB-HM24	HAIB-HM28/1	HAIB-HM28/2
			-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027							
Cobalt (Co)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper (Cu)	mg/L	0.02	<0.02	<0.02	0.12	<0.02	<0.02
Iron (Fe)	mg/L	0.05	0.59	0.73	1.1	2.3	1.0
Lead (Pb)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium (Mg)	mg/L	0.01	0.63	0.71	0.91	2.1	1.1
Manganese (Mn)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum (Mo)	mg/L	0.005	0.007	<0.005	0.005	<0.005	<0.005
Nickel (Ni)	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium (K)	mg/L	0.2	4.5	4.4	2.5	5.3	5.1
Selenium (Se)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silicon (Si)	mg/L	1	2.0	1.8	2.7	3.8	2.7
Sodium (Na)	mg/L	0.5	6.0	1.4	4.2	3.5	4.5
Sulphur (S)	mg/L	0.07	4.1	6.2	1.0	1.4	1.3

IS Insufficient sample for analysis
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UTD Unable to determine
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TEST REPORT

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Sample No.			JBX25-023757-01	JBX25-023757-02	JBX25-023757-03	JBX25-023757-04	JBX25-023757-05
Sample ID			HAIB-HM12	HAIB-HM22/1	HAIB-HM24	HAIB-HM28/1	HAIB-HM28/2
Sample Comment			-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027							
Vanadium (V)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc (Zn)	mg/L	0.01	0.02	0.02	0.02	0.04	0.03
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068							
Dissolved Mercury	µg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sample No.			JBX25-023757-06	JBX25-023757-07	JBX25-023757-08	JBX25-023757-09	JBX25-023757-10
Sample ID			HAIB-HM31R	HAIB-HM33	HAIB-HM42/1	HAIB-HM42/2	HAIB-HM42/3
Sample Comment			-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result	Result
Australian Standard Leaching Procedure - ASLP							
Leaching Solution *	-	-	ASLP LEACH	ASLP LEACH	ASLP LEACH	ASLP LEACH	ASLP LEACH
Final pH *	-	1.0	9.2	9.7	9.4	9.8	9.5
Determination of Electrical Conductivity (ME-AN-007) - LAB-QLT-MET-007							
Conductivity in mS/m 25°C	mS/m	2	3.6	5.7	3.8	6.3	5.5
Determination of Alkalinity (ME-AN-001) - LAB-QLT-MET-001							
Total Alkalinity as CaCO ₃	mg/L	12	30	40	25	35	35
Carbonate Alkalinity as CO ₃	mg/L	12	12	18	<12	18	<12
Bicarbonate Alkalinity as CaCO ₃	mg/L	12	<12	<12	25	<12	35
(P) Alkalinity as CaCO ₃	mg/L	12	20	15	<12	15	<12
(M) Alkalinity as CaCO ₃	mg/L	12	<12	25	25	20	35
Bicarbonate as CaCO ₃	mg/L	12	<12	<12	25	<12	35
Bicarbonate Alkalinity as HCO ₃	mg/L	12	<12	12	31	<12	43

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Koryx Copper Inc(Pty) Ltd
PROPOSED MINING ACTIVITIES FOR THE HAIB MINE
HYDROGEOLOGICAL PFS SPECIALIST ASSESSMENT



X Lab Earth Science PTY LTD
2 Samantha Street, Strydom Park, Randburg, 2169
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TEST REPORT

Report number
Client reference: 23757

Sample No.	JBX25-023757-06	JBX25-023757-07	JBX25-023757-08	JBX25-023757-09	JBX25-023757-10
Sample ID	HAIB-HM31R	HAIB-HM33	HAIB-HM42/1	HAIB-HM42/2	HAIB-HM42/3
Sample Comment	-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result
Determination of Alkalinity (ME-AN-001) - LAB-OLT-MET-001					
Carbonate Alkalinity as CaCO ₃	mg/L	12	20	30	<12
Determination of inorganic ions by IC (ME-AN-014) - LAB-OLT-MET-014					
Chloride	mg/L	0.05	0.30	0.16	0.23
Fluoride	mg/L	0.05	0.65	0.27	0.53
Nitrate as NO ₃	mg/L	0.1	0.2	<0.1	<0.1
Nitrate as N	mg/L	0.03	0.05	<0.03	<0.03
Sulphate	mg/L	0.05	1.6	1.0	1.8
Determination of TDS (ME-AN-011) - LAB-OLT-MET-011					
TDS (0.7µm) @ 105°C	mg/L	21	180	70	120
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-OLT-MET-027					
Aluminium (Al)	mg/L	0.02	1.4	0.86	1.4
Antimony (Sb)	mg/L	0.02	<0.02	<0.02	<0.02
Arsenic (As)	mg/L	0.01	<0.01	<0.01	<0.01
Barium (Ba)	mg/L	0.002	<0.002	<0.002	<0.002
Boron (B)	mg/L	0.005	<0.005	<0.005	<0.005
Cadmium (Cd)	mg/L	0.001	<0.001	<0.001	<0.001

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
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NA Not analysed
- Not applicable
UTD Unable to determine
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TEST REPORT

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Sample No.	JBX25-023757-06	JBX25-023757-07	JBX25-023757-08	JBX25-023757-09	JBX25-023757-10
Sample ID	HAIB-HM31R	HAIB-HM33	HAIB-HM42/1	HAIB-HM42/2	HAIB-HM42/3
Sample Comment	-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027					
Calcium (Ca)	mg/L	0.5	2.3	5.7	2.7
Chromium (Cr)	mg/L	0.002	<0.002	<0.002	<0.002
Cobalt (Co)	mg/L	0.005	<0.005	<0.005	<0.005
Copper (Cu)	mg/L	0.02	1.1	<0.02	0.87
Iron (Fe)	mg/L	0.05	1.2	0.22	1.7
Lead (Pb)	mg/L	0.01	<0.01	<0.01	<0.01
Magnesium (Mg)	mg/L	0.01	1.3	0.49	1.2
Manganese (Mn)	mg/L	0.01	<0.01	<0.01	<0.01
Molybdenum (Mo)	mg/L	0.005	0.29	0.005	<0.005
Nickel (Ni)	mg/L	0.005	<0.005	<0.005	<0.005
Potassium (K)	mg/L	0.2	2.1	2.8	3.8
Selenium (Se)	mg/L	0.01	<0.01	<0.01	<0.01
Silicon (Si)	mg/L	1	3.8	1.8	3.4

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TEST REPORT

Report number
Client reference: 23757

Sample No.			JBX25-023757-06	JBX25-023757-07	JBX25-023757-08	JBX25-023757-09	JBX25-023757-10
Sample ID			HAIB-HM31R	HAIB-HM33	HAIB-HM42/1	HAIB-HM42/2	HAIB-HM42/3
Sample Comment			-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027							
Sodium (Na)	mg/L	0.5	6.6	2.5	5.2	2.7	0.7
Sulphur (S)	mg/L	0.07	0.83	0.73	1.1	1.7	3.9
Vanadium (V)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc (Zn)	mg/L	0.01	0.03	0.02	0.04	0.04	0.02
Determination of Hg by CVAAS (ME-AN-066) - LAB-QLT-MET-066							
Dissolved Mercury	µg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sample No.			JBX25-023757-11	JBX25-023757-12	JBX25-023757-13	JBX25-023757-14	JBX25-023757-15
Sample ID			HAIB-HM42/4	HAIB-HM22/2	HAIB-HM22/3A	HAIB-HM22/3B	Deionised Water Blank
Sample Comment			-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result	Result	Result
Australian Standard Leaching Procedure - ASLP							
Leaching Solution *	-	-	ASLP LEACH	ASLP LEACH	ASLP LEACH	ASLP LEACH	ASLP LEACH
Final pH *	-	1.0	9.5	9.7	9.7	9.8	5.7
Determination of Electrical Conductivity (ME-AN-007) - LAB-QLT-MET-007							
Conductivity in mS/m 25°C	mS/m	2	6.0	5.0	8.3	8.4	<2
Determination of Alkalinity (ME-AN-001) - LAB-QLT-MET-001							
Total Alkalinity as CaCO ₃	mg/L	12	20	30	30	30	<12
Carbonate Alkalinity as CO ₃	mg/L	12	<12	18	18	18	<12
Bicarbonate Alkalinity as CaCO ₃	mg/L	12	20	<12	<12	<12	<12
(P) Alkalinity as CaCO ₃	mg/L	12	<12	15	15	15	<12
(M) Alkalinity as CaCO ₃	mg/L	12	20	15	15	15	<12

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LNR Sample listed but not received
LOR Limit of reporting
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NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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X Lab Earth Science PTY LTD
2 Samantha Street, Strydom Park, Randburg, 2169
Telephone Number: 011 590 3000
Email: info@xlab.co.za

TEST REPORT

Report number
Client reference: 23757

Sample No.	JBX25-023757-11	JBX25-023757-12	JBX25-023757-13	JBX25-023757-14	JBX25-023757-15
Sample ID	HAIB-HM42/4	HAIB-HM22/2	HAIB-HM22/3A	HAIB-HM22/3B	Deionised Water Blank
Sample Comment	-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result
Determination of Alkalinity (ME-AN-001) - LAB-QLT-MET-001					
Bicarbonate as CaCO ₃	mg/L	12	20	<12	<12
Bicarbonate Alkalinity as HCO ₃	mg/L	12	24	<12	<12
Carbonate Alkalinity as CaCO ₃	mg/L	12	<12	30	30
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014					
Chloride	mg/L	0.05	0.82	0.24	0.09
Fluoride	mg/L	0.05	0.14	0.23	<0.05
Nitrate as NO ₃	mg/L	0.1	0.5	<0.1	0.1
Nitrate as N	mg/L	0.03	0.11	<0.03	<0.03
Sulphate	mg/L	0.05	1.2	0.61	13
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011					
TDS (0.7µm) @ 105°C	mg/L	21	120	120	60
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027					
Aluminium (Al)	mg/L	0.02	1.7	2.5	0.84
Antimony (Sb)	mg/L	0.02	<0.02	<0.02	<0.02
Arsenic (As)	mg/L	0.01	<0.01	<0.01	<0.01
Barium (Ba)	mg/L	0.002	<0.002	<0.002	<0.002

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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TEST REPORT

Report number
Client reference: 23757

Sample No.	JBX25-023757-11	JBX25-023757-12	JBX25-023757-13	JBX25-023757-14	JBX25-023757-15
Sample ID	HAIB-HM42/4	HAIB-HM22/2	HAIB-HM22/3A	HAIB-HM22/3B	Deionised Water Blank
Sample Comment	-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027					
Boron (B)	mg/L	0.005	<0.005	<0.005	<0.005
Cadmium (Cd)	mg/L	0.001	<0.001	<0.001	<0.001
Calcium (Ca)	mg/L	0.5	4.9	4.8	7.9
Chromium (Cr)	mg/L	0.002	<0.002	<0.002	<0.002
Cobalt (Co)	mg/L	0.005	<0.005	<0.005	<0.005
Copper (Cu)	mg/L	0.02	0.18	<0.02	<0.02
Iron (Fe)	mg/L	0.05	1.7	2.5	0.42
Lead (Pb)	mg/L	0.01	<0.01	<0.01	<0.01
Magnesium (Mg)	mg/L	0.01	1.4	1.6	0.64
Manganese (Mn)	mg/L	0.01	<0.01	<0.01	<0.01
Molybdenum (Mo)	mg/L	0.005	<0.005	<0.005	<0.005
Nickel (Ni)	mg/L	0.005	<0.005	<0.005	<0.005
Potassium (K)	mg/L	0.2	6.1	3.7	4.2

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
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NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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Telephone Number: 011 590 3000
Email: info@xlab.co.za

TEST REPORT

Report number
Client reference: 23757

Sample No.	JBX25-023757-11	JBX25-023757-12	JBX25-023757-13	JBX25-023757-14	JBX25-023757-15
Sample ID	HAIB-HM42/4	HAIB-HM22/2	HAIB-HM22/3A	HAIB-HM22/3B	Deionised Water Blank
Sample Comment	-	-	-	-	-
Analysis	Unit	LOR	Result	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027					
Selenium (Se)	mg/L	0.01	<0.01	<0.01	<0.01
Silicon (Si)	mg/L	1	4.7	3.7	1.6
Sodium (Na)	mg/L	0.5	3.7	2.3	2.6
Sulphur (S)	mg/L	0.07	0.65	0.50	6.1
Vanadium (V)	mg/L	0.001	<0.001	<0.001	<0.001
Zinc (Zn)	mg/L	0.01	0.03	0.02	0.03
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068					
Dissolved Mercury	µg/L	0.001	<0.001	<0.001	<0.001

IS	Insufficient sample for analysis	NA	Not analysed
LNR	Sample listed but not received	-	Not applicable
LOR	Limit of reporting	UTD	Unable to determine
*	Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory	NR	Not Requested

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2 Samantha Street, Strydom Park, Randburg, 2169
Telephone Number: 011 590 3000
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TEST REPORT

Report number
Client reference: 23757

Sasha Maistry
Technical Signatory (Approver)

Sarah Newton
Technical Signatory (Reviewer)

Method	Method Summary
Australian Standard Leaching Procedure	A portion of waste is leached for 18 ± 2 hours, end-over-end, with either dilute acetic acid or dilute acetic acid and sodium hydroxide or deionised water at a liquid to solid ratio of 20:1. The choice of leaching solution is determined by final fate of the waste. The leachate is filtered and preserved as necessary prior to submission for analysis. Based on AS 4439-3:2019.
Determination of Electrical Conductivity (ME-AN-007)	The conductivity of an aliquot of aqueous sample is measured electrometrically using a standard cell connected to a calibrated meter with automated temperature correction. This method is based on Standard Methods for the Examination of Water and Wastewater 2510 B.
Determination of Alkalinity (ME-AN-001)	An aliquot of aqueous sample is titrated first to pH 8.3 and then to 4.3 using standardised acid. The volumes of acid titrated are used to calculate total alkalinity and/or alkaline species. The method is based on APHA 2320 B.
Determination of Inorganic Ions by IC (ME-AN-014)	Inorganic anions (Br, Cl, F, NO ₃ , NO ₂ , SO ₄) are determined on aqueous samples by ion chromatography (IC). The method is based on Standard Methods for the Examination of Water and Wastewater Method 4110 B. For soils and wastes anions are measured on 10:1 water extracts. Sulphate, nitrite, fluoride and chloride are determined on sorbent extracts by ion chromatography (IC) and the required pollutant concentration obtained by calculation. The method is based on radiello® methods F1, J1 and K1
Determination of TDS (ME-AN-011)	Total dissolved solids (TDS) is determined gravimetrically on a filtered aliquot of aqueous sample at 105 °C. The method is based on Standard Methods for the Examination of Water and Wastewater 2540 C.
Multi Element Determination of Metals by ICP OES (ME-AN-027)	Dissolved metals are determined on a filtered and acidified portion of aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.7 and Standard Methods for the Examination of Water and Wastewater Method 3120. Total metals are determined on a nitric acid digested portion of well-shaken aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2 and 200.7. Recoverable metals are determined on an acid digested portion of sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2, 3050B and 200.7. Silicon is not recovered. Metals are determined on acid digestions of filters by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on NIOSH 7300 and 7301.
Determination of Hg by CVAAS (ME-AN-068)	Mercury in aqueous solution is analysed by Cold Vapour Atomic Absorption Spectrometry (CV-AAS). The method is based on US EPA 245.7. Digestions of soils, wastes, filters and air monitoring samples are variously based on US EPA 200.2, 3050B, and Method 29 and EN 13211.

IS	Insufficient sample for analysis	NA	Not analysed
LNR	Sample listed but not received	-	Not applicable
LOR	Limit of reporting	UTD	Unable to determine
*	Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory	NR	Not Requested

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End of Report

Page 11 of 11



TEST REPORT

Contact	Diana Duthe	Project Number	W1301-00906/05
Client	Knight Piesold	Lab Reference	JBX25-023805
Email	dduthe@knightpiesold.com	Report Number	LIM25/1285
Address		Date Received	06-May-2025
Order Number		Date Test(s) Started	06-May-2025
Samples	2	Date Reported	29-May-2025
Sample Matrix	Leach		

The document is issued in accordance with SANAS's accreditation requirements. Accredited for compliance with ISO/IEC 17025. SANAS accredited laboratory T0775. Results marked "Subcontracted Test" in this report are not included in the SANAS Scope of Accreditation for this laboratory.



Sample No.			JBX25-023805-01	JBX25-023805-02
Sample ID			Haib Flotation Tailings	DI Blank
Sample Comment			-	-
Analysis	Unit	LOR	Result	Result
Australian Standard Leaching Procedure - ASLP				
Leaching Solution *	-	-	ASLP LEACH	ASLP LEACH
Final pH *	-	1.0	9.6	5.1
Determination of Electrical Conductivity (ME-AN-007) - LAB-QLT-MET-007				
Conductivity in mS/m 25°C	mS/m	2	7.8	<2
Determination of Alkalinity (ME-AN-001) - LAB-QLT-MET-001				
Total Alkalinity as CaCO ₃	mg/L	12	30	<12
Carbonate Alkalinity as CO ₃	mg/L	12	18	<12
Bicarbonate Alkalinity as CaCO ₃	mg/L	12	<12	<12
(P) Alkalinity as CaCO ₃	mg/L	12	15	<12
(M) Alkalinity as CaCO ₃	mg/L	12	15	<12
Bicarbonate as CaCO ₃	mg/L	12	<12	<12
Bicarbonate Alkalinity as HCO ₃	mg/L	12	<12	12
Carbonate Alkalinity as CaCO ₃	mg/L	12	30	<12
Determination of Inorganic Ions by IC (ME-AN-014) - LAB-QLT-MET-014				
Chloride	mg/L	0.05	0.19	<0.05
Fluoride	mg/L	0.05	0.24	<0.05
Nitrate as NO ₃	mg/L	0.1	0.1	<0.1
Nitrate as N	mg/L	0.03	<0.03	<0.03
Sulphate	mg/L	0.05	14	<0.05
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011				
TDS (0.7µm) @ 105°C	mg/L	21	120	<21
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027				
Aluminium (Al)	mg/L	0.02	1.2	<0.02

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
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NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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TEST REPORT

Report number
Client reference: 23805

Sample No.	JBX25-023805-01		JBX25-023805-02	
Sample ID	Haib Flotation Tailings		DI Blank	
Sample Comment	-		-	
Analysis	Unit	LOR	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027				
Antimony (Sb)	mg/L	0.02	<0.02	<0.02
Arsenic (As)	mg/L	0.01	<0.01	<0.01
Barium (Ba)	mg/L	0.002	<0.002	<0.002
Boron (B)	mg/L	0.005	<0.005	<0.005
Cadmium (Cd)	mg/L	0.001	<0.001	<0.001
Calcium (Ca)	mg/L	0.5	9.8	<0.5
Chromium (Cr)	mg/L	0.002	<0.002	<0.002
Cobalt (Co)	mg/L	0.005	<0.005	<0.005
Copper (Cu)	mg/L	0.02	<0.02	<0.02
Iron (Fe)	mg/L	0.05	0.91	<0.05
Lead (Pb)	mg/L	0.01	<0.01	<0.01
Magnesium (Mg)	mg/L	0.01	0.94	<0.01
Manganese (Mn)	mg/L	0.01	<0.01	<0.01
Molybdenum (Mo)	mg/L	0.005	<0.005	<0.005
Nickel (Ni)	mg/L	0.005	<0.005	<0.005
Potassium (K)	mg/L	0.2	2.3	<0.2
Selenium (Se)	mg/L	0.01	<0.01	<0.01
Silicon (Si)	mg/L	1	2.3	<1
Sodium (Na)	mg/L	0.5	5.3	<0.5
Sulphur (S)	mg/L	0.07	6.0	<0.07
Vanadium (V)	mg/L	0.001	<0.001	<0.001

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

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2 Samantha Street, Strydom Park, Randburg, 2169
Telephone Number: 011 590 3000
Email: info@xlab.co.za

TEST REPORT

Report number
Client reference: 23805

Sample No. Sample ID	JBX25-023805-01		JBX25-023805-02	
	Haib Flotation Tailings		DI Blank	
Sample Comment	-		-	
	-		-	
Analysis	Unit	LOR	Result	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027				
Zinc (Zn)	mg/L	0.01	<0.01	<0.01
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068				
Dissolved Mercury	µg/L	0.001	<0.001	<0.001

Sasha Maistry
Technical Signatory (Approver)

Sarah Newton
Technical Signatory (Reviewer)

Method	Method Summary
Australian Standard Leaching Procedure	A portion of waste is leached for 18 ± 2 hours, end-over-end, with either dilute acetic acid or dilute acetic acid and sodium hydroxide or deionised water at a liquid to solid ratio of 20:1. The choice of leaching solution is determined by final fate of the waste. The leachate is filtered and preserved as necessary prior to submission for analysis. Based on AS 4439-3:2019.
Determination of Electrical Conductivity (ME-AN-007)	The conductivity of an aliquot of aqueous sample is measured electrometrically using a standard cell connected to a calibrated meter with automated temperature correction. This method is based on Standard Methods for the Examination of Water and Wastewater 2510 B.
Determination of Alkalinity (ME-AN-001)	An aliquot of aqueous sample is titrated first to pH 8.3 and then to 4.3 using standardised acid. The volumes of acid titrated are used to calculate total alkalinity and/or alkaline species. The method is based on APHA 2320 B.
Determination of inorganic ions by IC (ME-AN-014)	Inorganic anions (Br, Cl, F, NO ₃ , NO ₂ , SO ₄) are determined on aqueous samples by ion chromatography (IC). The method is based on Standard Methods for the Examination of Water and Wastewater Method 4110 B. For soils and wastes anions are measured on 10:1 water extracts. Sulphate, nitrite, fluoride and chloride are determined on sorbent extracts by ion chromatography (IC) and the required pollutant concentration obtained by calculation. The method is based on radiello® methods F1, J1 and K1
Determination of TDS (ME-AN-011)	Total dissolved solids (TDS) is determined gravimetrically on a filtered aliquot of aqueous sample at 105 °C. The method is based on Standard Methods for the Examination of Water and Wastewater 2540 C.
Multi Element Determination of Metals by ICP OES (ME-AN-027)	Dissolved metals are determined on a filtered and acidified portion of aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.7 and Standard Methods for the Examination of Water and Wastewater Method 3120. Total metals are determined on a nitric acid digested portion of well-shaken aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2 and 200.7. Recoverable metals are determined on an acid digested portion of sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2, 3050B and 200.7. Silicon is not recovered. Metals are determined on acid digestions of filters by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on NIOSH 7300 and 7301.
Determination of Hg by CVAAS (ME-AN-068)	Mercury in aqueous solution is analysed by Cold Vapour Atomic Absorption Spectrometry (CV-AAS). The method is based on US EPA 245.7. Digestions of soils, wastes, filters and air monitoring samples are variously based on US EPA 200.2, 3050B, and Method 29 and EN 13211.

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

Samples analysed as received. Solid samples expressed on a dry weight basis. Unless otherwise indicated, samples were received in containers fit for purpose at ambient temperature. This document is issued by the Company under its General Conditions of Service. Attention is drawn to the limitation of liability, and jurisdiction issues defined therein. **WARNING:** The sample(s) to which the findings recorded herein (the "Findings") relate was(were) draw and/ or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativity of all goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. The document is issued in accordance with SANAS's accreditation requirements and shall not be reproduced, except in full, without written approval of the laboratory.

End of Report

Page 3 of 3



TEST REPORT

Contact	Diana Duthe	Project Number	WI301-00906/05
Client	Knight Piesold	Lab Reference	JBX25-023809
Email	dduthe@knightpiesold.com	Report Number	LIM25/1289
Address		Date Received	07-May-2025
Order Number		Date Test(s) Started	07-May-2025
Samples	1	Date Reported	30-May-2025
Sample Matrix	Geochem		

The document is issued in accordance with SANAS's accreditation requirements. Accredited for compliance with ISO/IEC 17025. SANAS accredited laboratory T0775. Results marked "Subcontracted Test" in this report are not included in the SANAS Scope of Accreditation for this laboratory.



Sample No.	JBX25-023809-01		
Sample ID	HAIB Flotation Tailings		
Sample Comment			
Analysis	Unit	LOR	Result
Paste pH (ME-AN-024) - LAB-QLT-MET-024			
Paste pH	-	-	8.6
Modified acid base accounting (ME-AN-025) - LAB-QLT-MET-025			
NP as kg CaCO ₃ /T	kg CaCO ₃ /T	-	22
Classification *	-	-	PAN
Fizz Rating	-	-	0
Acid Potential *	Kg CaCO ₃ /T	0.31	<0.31
Net Neutralising Potential *	Kg CaCO ₃ /T	-	22
NP AP Ratio *	-	-	710
Sulphur and Carbon Species (Subcontracted) - -			
Total Sulphur as S *	%	0.01	0.03
Sulphide as S *	%	0.01	<0.01
Total Carbon as C *	%	0.01	0.27
Carbonate as CO ₃ *	%	0.01	1.3
Organic Carbon as C *	%	0.01	0.01
Inorganic Carbon as C *	%	0.01	0.25
2 endpoint static net acid generation (nag) (ME-AN-028) - LAB-QLT-MET-028			
NAG pH *		0.1	6.6
NAG as kg H ₂ SO ₄ /tonne at pH 4.5 *		0.5	<0.5
NAG as kg H ₂ SO ₄ /tonne at pH 7.0 *	kg H ₂ SO ₄ /T	0.5	1.0
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027			
Antimony	mg/kg	2	<2
Arsenic	mg/kg	1	<1
Barium	mg/kg	0.2	110
Boron	mg/kg	0.5	0.5

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
NR Not Requested

Samples analysed as received. Solid samples expressed on a dry weight basis. Unless otherwise indicated, samples were received in containers fit for purpose at ambient temperature. This document is issued by the Company under its General Conditions of Service. Attention is drawn to the limitation of liability, and jurisdiction issues defined therein. WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) draw and/ or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativity of all goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. The document is issued in accordance with SANAS's accreditation requirements and shall not be reproduced, except in full, without written approval of the laboratory.



TEST REPORT

Report number
Client reference: 23809

Sample No.	JBX25-023809-01		
Sample ID	HAIB Flotation Tailings		
Sample Comment	-		
Analysis	Unit	LOR	Result
Multi Element Determination of Metals by ICP OES (ME-AN-027) - LAB-QLT-MET-027			
Cadmium	mg/kg	0.1	<0.1
Calcium	mg/kg	50	11000
Chromium	mg/kg	0.2	340
Cobalt	mg/kg	0.5	<0.5
Copper	mg/kg	2	110
Lead	mg/kg	1	<1
Magnesium	mg/kg	1	10041
Manganese	mg/kg	1	418
Molybdenum	mg/kg	0.5	46
Nickel	mg/kg	0.5	210
Potassium	mg/kg	20	3503
Selenium	mg/kg	1	<1
Sodium	mg/kg	50	229
Vanadium	mg/kg	0.1	16
Zinc	mg/kg	1	50
Determination of Hg by CVAAS (ME-AN-068) - LAB-QLT-MET-068			
Mercury	µg/kg	0.1	9.0
Determination of inorganic ions by IC (ME-AN-014) - LAB-QLT-MET-014			
Fluoride as F	mg/Kg	0.5	<0.5
Chloride *	mg/kg	5	<5
Nitrate *	mg/kg	5	<5
Sulphate *	mg/kg	5	13
Sulphur and Carbon Species (Subcontracted) - -			
Sulphate as SO ₄ *	%	0.01	0.10
Subcontract - Subcontract			
XRD *	-	0.1	X-Lab25-4
Determination of TDS (ME-AN-011) - LAB-QLT-MET-011			
TDS (0.7µm) @ 105°C *	mg/kg	21	450

IS Insufficient sample for analysis
LNR Sample listed but not received
LOR Limit of reporting
* Not SANAS accredited. This result is not included in the SANAS scope of accreditation for this laboratory

NA Not analysed
- Not applicable
UTD Unable to determine
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TEST REPORT

Report number
Client reference: 23809

Sasha Maistry
Technical Signatory (Approver)

Sarah Newton
Technical Signatory (Reviewer)

Method	Method Summary
Paste pH (ME-AN-024)	Paste pH is determined by mixing a portion of sample with water at a low liquid to solid ratio and measuring the pH of the resulting paste. Based on MEND 1.16.1
Modified acid base accounting (ME-AN-025)	The modified Sobek neutralising potential (NP) is determined by treating a portion of the sample with excess HCl over 24 hours. The unconsumed acid is titrated with NaOH. The calcium carbonate (CaCO ₃) equivalent is then calculated. This method is based on MEND 1.16.1. Total sulphur, sulphide, sulphate, total carbon, carbonate, inorganic and organic carbon are determined by combustion infra-red spectrometry and calculation. The testing is subcontracted. Acid potential, net neutralising potential and the ratio of neutralising potential to acid potential are calculated. The waste is classified w.r.t acid generation or neutralisation potential based on these results. Based on Mend 1.20.1
Sulphur and Carbon Species (Subcontracted)	Total sulphur, sulphide, sulphate, total carbon, carbonate, inorganic and organic carbon are determined by combustion infra-red spectrometry and calculation. The testing is subcontracted.
2 endpoint static net acid generation (nag) (ME-AN-026)	A portion of the sample is reacted overnight with hydrogen peroxide. After boiling to remove excess peroxide the sample is titrated first to pH 7 and then to pH 4.5. Based on Amira P387-A
Multi Element Determination of Metals by ICP OES (ME-AN-027)	Dissolved metals are determined on a filtered and acidified portion of aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.7 and Standard Methods for the Examination of Water and Wastewater Method 3120. Total metals are determined on a nitric acid digested portion of well-shaken aqueous sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2 and 200.7. Recoverable metals are determined on an acid digested portion of sample by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on US EPA 200.2, 3050B and 200.7. Silicon is not recovered. Metals are determined on acid digestions of filters by inductively coupled plasma optical emission spectrometry (ICP-OES). The method is based on NIOSH 7300 and 7301.
Determination of Hg by CVAAS (ME-AN-068)	Mercury in aqueous solution is analysed by Cold Vapour Atomic Absorption Spectrometry (CV-AAS). The method is based on US EPA 245.7. Digestions of soils, wastes, filters and air monitoring samples are variously based on US EPA 200.2, 3050B, and Method 29 and EN 13211.
Determination of inorganic ions by IC (ME-AN-014)	Inorganic anions (Br, Cl, F, NO ₃ , NO ₂ , SO ₄) are determined on aqueous samples by ion chromatography (IC). The method is based on Standard Methods for the Examination of Water and Wastewater Method 4110 B. For soils and wastes anions are measured on 10:1 water extracts. Sulphate, nitrite, fluoride and chloride are determined on sorbent extracts by ion chromatography (IC) and the required pollutant concentration obtained by calculation. The method is based on radiello® methods F1, J1 and K1
Subcontract	This test has been subcontracted. Methodology not specified.
Determination of TDS (ME-AN-011)	Total dissolved solids (TDS) is determined gravimetrically on a filtered aliquot of aqueous sample at 105 °C. The method is based on Standard Methods for the Examination of Water and Wastewater 2540 C.

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End of Report

Page 3 of 3



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XRD Analytical and Consulting cc
75 Kafue Street, Lynnwood Glen,
0081, South Africa

CLIENT: X-Lab Earth

DATE: 15 May 2025

SAMPLES: 14 Samples (JBX25-023738)

ANALYSIS: Qualitative and quantitative XRD

The material was prepared for XRD analysis using a back-loading preparation method. Diffractograms were obtained using a Malvern Panalytical Aeris diffractometer with a PIXcel detector and fixed slits with Fe-filtered Co-K α 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 the 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.
- Due to preferred orientation, and crystallite size effects, results may not be as accurate as shown.
- Smectite, lizardite (serpentine), vermiculite, chlorite, and kaolinite peaks overlap, and further tests would be necessary to distinguish them. Identification is largely based on peak shapes and positions.
- Traces of additional phases such as smectite may be present. Amounts below 0.5 weight % may be unreliable.
- Amorphous phases, if present, were not taken into consideration during quantification.

If you have any further queries, kindly contact me.

Analyst: Wiebke Grote

A handwritten signature in black ink, appearing to read 'Wiebke Grote', is written over a light blue background.

Authorized: Dr. Sabine Verryn (Pr.Sci.Nat)

Samples will be stored for 3 months after which they will be discarded.

Koryx Copper Inc(Pty) Ltd
PROPOSED MINING ACTIVITIES FOR THE HAIB MINE
HYDROGEOLOGICAL PFS SPECIALIST ASSESSMENT

XRD Analytical and Consulting cc

	Quartz	Plagioclase	Microcline	Chlorite	Biotite	Muscovite	Calcite	Dolomite	Pyrite
JBX25-023738_01	56.2	5.8	5.2	4.1	1.3	24.8	1.3	0	1.3
JBX25-023738_02	42.9	29.1	8.4	4.2	11.4	2.3	1.2	0	0.5
JBX25-023738_03	49.6	23.2	9.5	5.0	1.8	11.0	0	0	0
JBX25-023738_04	46.3	6.2	0.6	14.0	1.6	26.7	1.9	2.6	0
JBX25-023738_05	43.0	15.7	4.5	9.7	6.7	16.3	1.1	3.0	0
JBX25-023738_06	52.5	14.7	11.1	6.2	0.7	14.6	0.1	0	0
JBX25-023738_07	57.1	9.0	12.6	4.3	1.0	13.8	2.3	0	0
JBX25-023738_08	54.9	13.4	11.7	8.3	1.5	10.2	0	0	0
JBX25-023738_09	50.2	17.2	10.2	7.2	4.4	8.5	1.5	0.9	0
JBX25-023738_10	56.8	5.9	5.9	1.4	1.3	26.1	2.6	0	0
JBX25-023738_11	45.2	6.0	15.6	5.7	5.7	21.8	0	0	0
JBX25-023738_12	57.0	11.0	13.7	4.2	7.0	5.2	0.6	1.3	0
JBX25-023738_13	43.8	41.0	0	3.6	11.5	0	0	0	0
JBX25-023738_14	48.2	23.5	3.8	4.6	10.1	8.1	0.6	1.2	0

0 = n.d. – not detected above the detection limit of 0.5-3 weight percent

Limitation of Liability: Although every effort is made to provide reliable and accurate results, by use of the results the client agrees that "XRD Analytical and Consulting cc" and/or its staff can only be held liable for the cost of the analysis.



Dr Sabine Verryn

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XRD Analytical and Consulting cc
75 Kafue Street, Lynnwood Glen,
0081, South Africa

CLIENT: X-Lab Earth
DATE: 15 May 2025
SAMPLES: 1 Sample (JBX25-023809)
ANALYSIS: Qualitative and quantitative XRD

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

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

Comment:

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If you have any further queries, kindly contact me.

Analyst: Wiebke Grote

Authorized: Dr. Sabine Verryn (Pr.Sci.Nat)

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www.xrd.co.za

Koryx Copper Inc(Pty) Ltd
PROPOSED MINING ACTIVITIES FOR THE HAIB MINE
HYDROGEOLOGICAL PFS SPECIALIST ASSESSMENT

XRD Analytical and Consulting cc

	Quartz	Plagioclase	Microcline	Chlorite	Muscovite	Biotite	Calcite
JBX25-023738_01	47.0	10.5	1.1	11.3	28.1	1.5	0.5

0 = n.d. – not detected above the detection limit of 0.5-3 weight percent

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