SAND MINING OPERATIONS OF COLMON MINING CC WINDHOEK

ENVIRONMENTAL IMPACT ASSESSMENT
SCOPING REPORT

Assessed by:

Assessed for:

Colmon Mining CC

August 2015

Project:	**ENVIRONMENTAL IMPACT ASSESSMENT SCOPING REPORT FOR THE SAND MINING ACTIVITIES OF COLMON MINING CC IN THE USIP RIVER, FARM ARIS NO. 29**	
Report Version/Date	September 2020 Update	
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Report Approval	 **André Faul** Conservation Ecologist	

I, FWJ CARSTENS, acting as the Proponent's representative (Colmon Mining), hereby approve this report and confirm that the project description contained in herein is a true reflection of the information which the proponent has provided to Geo Pollution Technologies. All material information in the possession of the proponent that reasonably has or may have the potential of influencing any decision or the objectivity of this assessment is fairly represented in this report.

Signed at WINDHOEK on the 1ST day of OCTOBER 2020.

Colmon Mining CC

CC/2014/05403
Registration No.

EXECUTIVE SUMMARY

Colmon Mining CC (here on referred to as Colmon Mining) has requested Geo Pollution Technologies (PTY) Ltd to undertake an Environmental Impact Assessment (EIA) for their existing mining operations in the Usip River on farm Aris (No. 29). Operations consist of the excavation and screening of sand and loading it onto tipper trucks for transport to clients. Clients also collect and transport sand using their own trucks.

Operational activities include the following:

1. Removal and storage of the overburden at the quarries;
2. Excavation of sand with excavators;
3. Passing excavated sand through screens to separate sand and stones;
4. Loading of sand on tipper trucks and subsequent transport;
5. Landscaping of quarries and return of overburden once quarrying is completed.

This study is conducted to determine all environmental, safety, health and socio-economic impacts associated with the sand mining operations of Colmon Mining. Relevant environmental data has been compiled by making use of secondary data and from a reconnaissance site visit. Potential environmental impacts and associated social impacts will be identified and addressed in this report.

The mining operations ensure a reliable and secure supply of sand for the local and regional construction industry. The sand mining processes of Colmon Mining provide employment to five staff members involved in the excavation and transport of the sand.

The table below provides a summary of the expected negative and positive impacts expected from the operations of the mine. A more negative value indicates a potentially greater negative impact whereas a positive value indicates a positive or beneficial impact. These ratings are provided for impacts prior to the administration of preventative or mitigation measures and realised impacts are expected to be more favourable.

Environmental risks associated with the mining activities are related to ecosystem and biodiversity impacts, groundwater, surface water and soil impacts, noise, dust and potential safety impacts associated with open quarries. Impacts can however be prevented and managed through implementing preventative measures and sound management systems as stipulated in this report and the accompanying Environmental Management Plan. It is recommended that environmental performance be monitored regularly to ensure compliance and that corrective measures be taken if necessary.

Summary of expected operational phase impacts prior to mitigation:

Impact Category	Impact Type	Class Value
BE	Waste Production	-1
BE	Ecosystem and Biodiversity Impact	-4
BE	Poaching, Hunting or Removal of Plant Material	-4
EO	Fire	-3
PC	Dust Pollution	-2
PC	Groundwater, Surface Water and Soil Contamination	-3
SC	Skills, Technology & Development	3
SC	Employment	2
SC	Traffic	-2
SC	Health, Safety & Security	-2
SC	Noise	-1
SC	Visual Impact	-1
SC	Heritage Impact	-3
	Cumulative Impact	-2

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
CBD	Convention on Biological Diversity
CITES	Convention on International Trade of Endangered Species
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
GPT	Geo Pollution Technologies (Pty) Ltd
HIV	Human Immunodeficiency Virus
I&APs	Interested and Affected Parties
IUCN	International Union for Conservation of Nature
m/s	Meter per second
MAWF	Ministry of Agriculture, Water and Forestry
mbs	Meters below surface
MET	Ministry of Environment and Tourism
mm/a	Millimetres per annum
MSDS	Material Safety Data Sheet
PPE	Personal Protective Equipment
PPPPs	Projects, Plans, Programmes and Policies
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

GLOSSARY OF TERMS

Alternatives - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The "no-go" alternative constitutes the 'without project' option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

Assessment - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

Competent Authority - means a body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

Cumulative Impacts - in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Environment - As defined in the Environmental Assessment Policy and Environmental Management Act - "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, palaeontological or social values".

Environmental Impact Assessment (EIA) - process of assessment of the effects of a development on the environment.

Environmental Management Plan (EMP) - A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.

Environmental Management System (EMS) - An Environment Management System, or EMS, is a comprehensive approach to managing environmental issues, integrating environment-oriented thinking into every aspect of business management. An EMS ensures environmental considerations are a priority, along with other concerns such as costs, product quality, investments, PR productivity and strategic planning. An EMS generally makes a positive impact on a company's bottom line. It increases efficiency and focuses on customer needs and marketplace conditions, improving both the company's financial and environmental performance. By using an EMS to convert environmental problems into commercial opportunities, companies usually become more competitive.

Evaluation – means the process of ascertaining the relative importance or significance of information, the light of people's values, preference and judgements in order to make a decision.

Hazard - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

Interested and Affected Party (I&AP) - any person, group of persons or organisation interested in, or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

Mitigate - The implementation of practical measures to reduce adverse impacts.

Proponent (Applicant) - Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment & Tourism.

Public - Citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom

may emerge at any time during the process depending on their particular concerns and the issues involved.

Scoping Process - process of identifying: issues that will be relevant for consideration of the application; the potential environmental impacts of the proposed activity; and alternatives to the proposed activity that are feasible and reasonable.

Significant Effect/Impact - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment

Stakeholder Engagement - The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term "public participation".

Stakeholders - A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (I&APs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Sustainable Development - "Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations" – the definition of the World Commission on Environment and Development (1987). "Improving the quality of human life while living within the carrying capacity of supporting ecosystems" – the definition given in a publication called "Caring for the Earth: A Strategy for Sustainable Living" by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

1 BACKGROUND AND INTRODUCTION

Colmon Mining CC has requested Geo Pollution Technologies (PTY) Ltd to undertake an Environmental Impact Assessment (EIA) in order to operate a sand mine in the Usip River on Farm Aris (No. 29), in the Khomas Region (Figure 1). Operations consist of the excavation, screening and transport of sand, and include:

1. Removal and storage of the overburden at the quarries;
2. Excavation of sand with excavators;
3. Passing excavated sand through screens to separate sand and stones;
4. Loading of sand on clients' tipper trucks;
5. Landscaping of quarries and return of overburden once quarrying is completed.

Company Background – Colmon Mining has been operating the Usip River sand mine on farm Aris for the past 20 years. The mined sand is mainly used in the construction industry in Windhoek and the region.

A risk assessment was undertaken to determine the potential environmental and social impact of the operations of the sand mine on the environment. This will enable decision makers to make an informed decision regarding the mining operations from an environmental perspective. The environmental assessment was conducted to apply for an environmental clearance certificate in compliance with Namibia's Environmental Management Act.

Project Justification –Sand is an essential resource in the construction industry. Windhoek is a fast growing city and sand is required in large volumes for cement works and brickmaking. Colmon Mining plays an important role in the delivery of sand to the construction industry.

Potential Direct Benefits:

- Reliable and secure supply of sand for the local and regional construction industry
- Employment
- Education and skills transfer

Potential Indirect Benefits:

- Economic growth and development of Windhoek and the Khomas Region

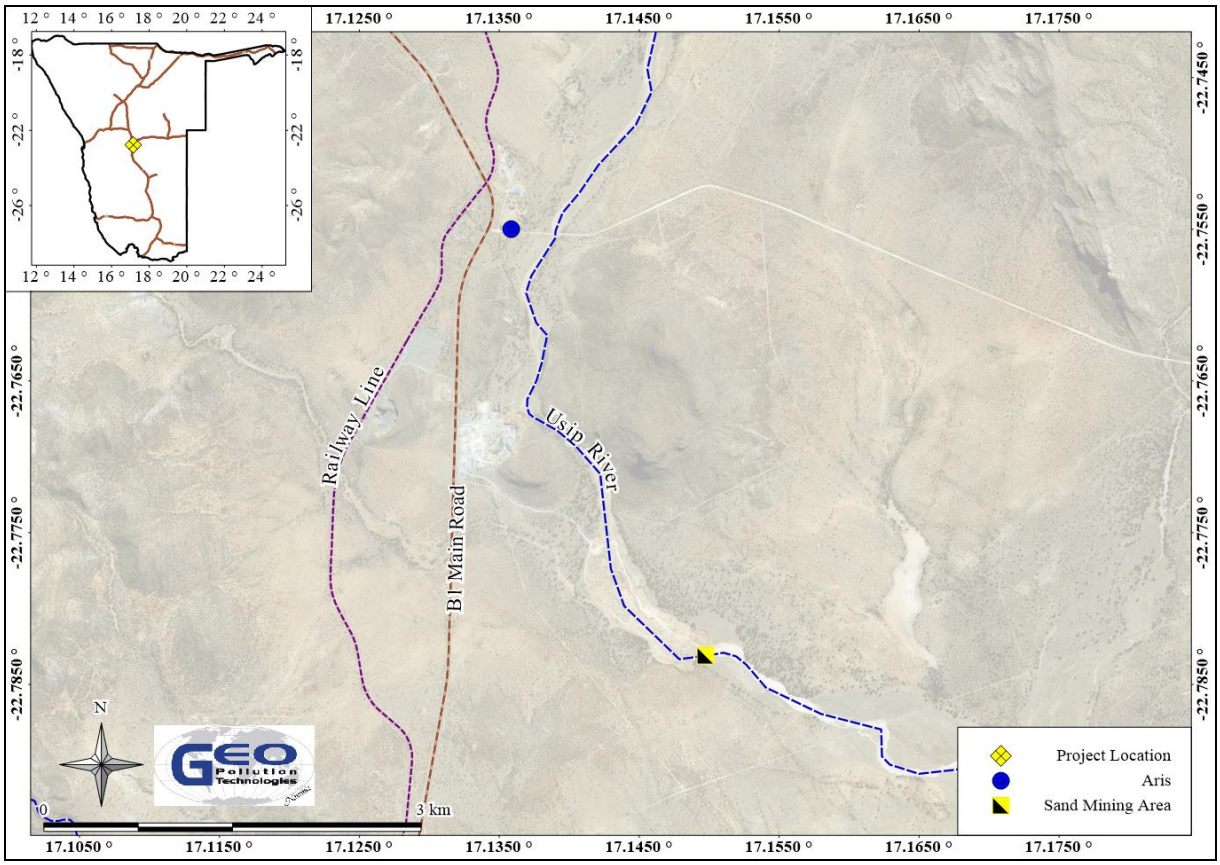


Figure 1. Location Map Indicating the Sand Quarry

2 SCOPE

The scope of the EIA is to determine the potential environmental impacts emanating from the operations of the sand mine. Relevant environmental data has been compiled by making use of secondary data and from a reconnaissance site visit. Potential environmental impacts and associated social impacts will be identified and addressed in this report.

The aims and objectives of this report are to:

1. Provide sufficient information to determine whether the sand mine and its operations will result in significant adverse impacts;
2. Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels;
3. Comply with Namibia's Environmental Management Act (2007);
4. Provide sufficient information to the Ministry of Environment and Tourism to make an informed decision regarding the sand mine.

3 METHODOLOGY

The following methods were used to investigate the potential impacts on the social and natural environment due to the sand mine:

1. Baseline information about the site and its surroundings was obtained from existing secondary information as well as from a reconnaissance site visit.
2. As part of the scoping process to determine potential environmental impacts, Interested and Affected Parties (I&APs) were consulted about their views, comments and opinions and these are put forward in this report.

4 DEVELOPMENT AND RELATED ACTIVITIES

Colmon Mining's sand mine is located in the Usip River on Farm Aris (No. 29) (22.7756 °S, 17.1437 °E) (Figure 1). The sand quarry has been operated by Colmon Mining for the past 20 years, although mining activities at this quarry have taken place for approximately 45 years. The resource is mined by both Colmon Mining and Kunene Building Supplies, the latter having their own prepared environmental impact assessment and management plan.

4.1 Operations

Colmon Mining currently operates one frontend loader and one power screen at the site. The excavators are used to remove the overburden (topsoil and vegetation) at the sand quarry. The overburden is stored in heaps towards the edges of the quarry pits. Sand is then excavated and passed through the power screens in order to separate the sand from larger stones. Sand is loaded onto tipper trucks belonging to customers, weighed at the weighbridge situated at the Aris stone quarry belonging to Kunene Building Supplies CC and then transported to construction sites. Once the quarry pit has been depleted, landscaping is performed with excavators. This includes collapsing steep sides where present, as well as returning overburden to the site. Based on current demand Colmon Mining supplies between 3,000 m^3 and 4,000 m^3 of sand per month.

The direct employment created by the sand mining process consists of nine people who work as excavator and screen operators. Operating hours of the quarry are from 07:30 to 13:00 and from 13:30 to 17:00 Monday to Friday. No personnel stays on the site and workers are transported from and to Windhoek on a daily basis. Site security is provided by a security guard employed by Kunene Building Supplies CC at the Aris stone quarry.

Photo 1. Sand mining process taking place in Sand Quarry

Photo 2. Overburden from Sand Mining Processes

Photo 3. Side walls of Sand Quarry

Photo 4. Previously Mined Area

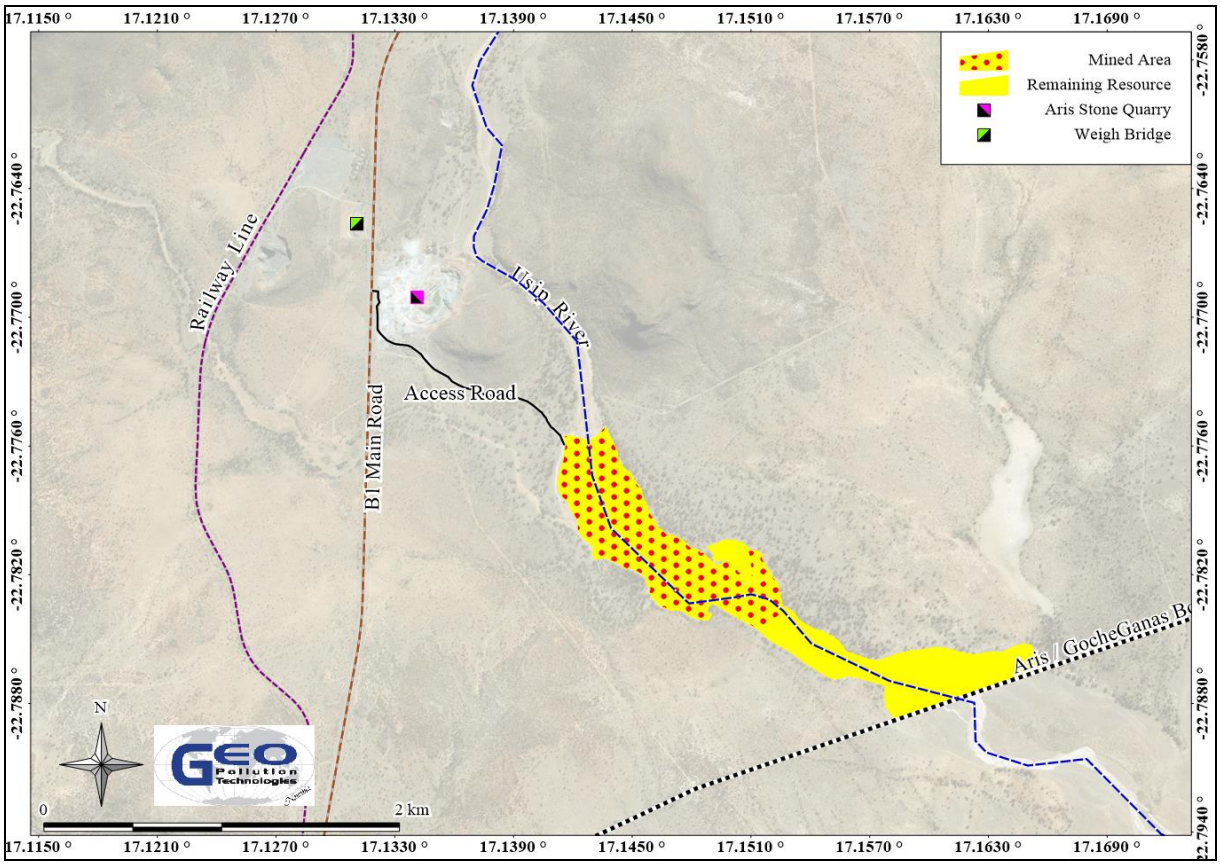


Figure 2. Site Layout

4.2 Traffic Flow

For the period 31 July 2019 to 1 August 2020 a total of 2,160 trucks (ranging from 5 to 34 tons) visited the Colmon Mining sand mines. An additional 6,977 trucks visited the Kunene Building Supplies stone and sand mine on the same property. This translates to 9,137 trucks in total. Operating days are Monday to Saturday and this means an average of 29 to 30 trucks per day.

The above truck volumes can be used as a reasonable estimate for truck volumes expected for the next three years. This may however change with changes in the demand for sand and stone in the Windhoek District as well as the opening and closure of similar mines elsewhere in the district.

The road junction servicing the Colmon Mining quarry is situated 477 m from the turnoff to the weighbridge (Figure 3). Option 1 as indicated on Figure 3 was considered as an alternative access road for the quarries. However, after consultation with Roads Authority this was not deemed a feasible junction. Considering the road profile diagram in Figure 3 it is clear that the current junction is situated just south of the highest point between the weighbridge and the turnoff named "other". Moving the turnoff north with a few meters would ensure that it is situated at the highest elevation, thus ensuring that trucks turning onto the B1 has a clear line of sight to the north and south. Approaching vehicles will also clearly see large vehicles turning at the junction. Furthermore this junction is situated 600 m from the nearest bend in the B1 road towards the north and almost 2,000 m from the nearest bend in the B1 towards the south, also ensuring clear line of sight.

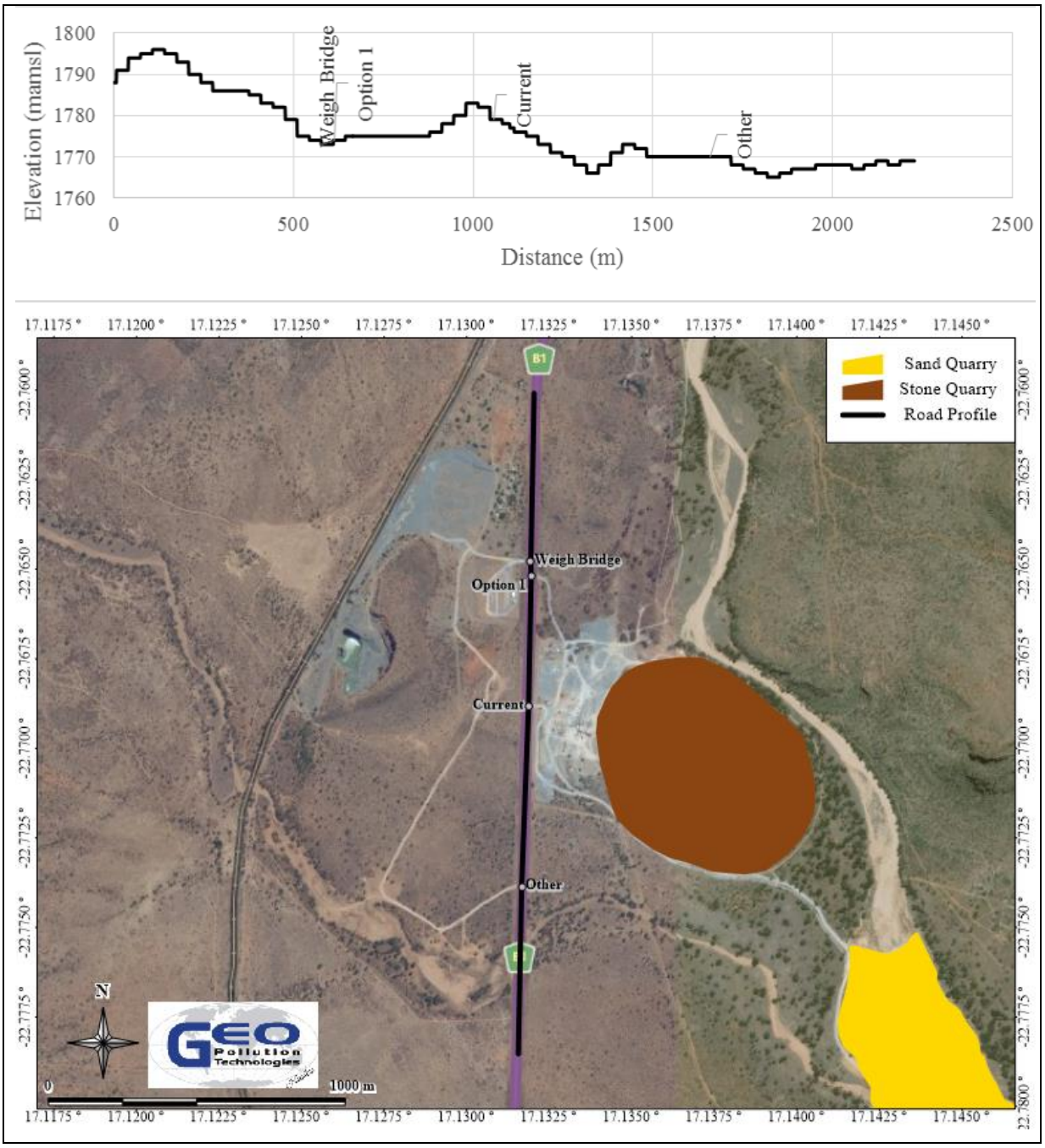


Figure 3. Current Road Junction of the Sand and Stone Quarries with Respect to B1 Main Road Features and Road Elevation Profile in Meters above Mean Sea Level (MAMSL)

4.3 Sand mining plan

The sand mining plan is prepared for a period of three years after which a clearance renewal has to be conducted. At that stage the sand mining plan can be updated. The demand for sand will however vary depending on the construction industry and the presence of other sand mines in the area. The sand mining plan may therefore change according to demand.

During the period 31 July 2019 to 30 June 2020, Colmon Mining extracted 37,440 tons of sand. Based on this value an estimated 105,000 tons at an average of 35,000 tons per year are expected to be mined during the next three years.

Sand is mined to a depth of 2.8 m below the surface. Sand density at the mine location is 1.5 tons/m^3. At the expected 35,000 tons of sand the surface area to be mined is 8,333 m^2 (0.83 hectares) per year or 25,000 m^2 (2.5 hectares) over the next three years.

At the same location, Kunene Building Supplies also operates a sand mine for which a separate EIA has been submitted. To present the complete scenario of mining at the project location, an account of the sand mining of Kunene Building Supplies is also presented.

Kunene Building Supplies extracted 34,751 tons of sand (1.8 m deep) during the period 01 August 2019 to 31 July 2020. This translates into 38,886 m^2 (3.9 hectares) to be mined over the next three years.

Figure 4 presents the area targeted for mining by Colmon Mining and Kunene Building Supplies over the next three years.

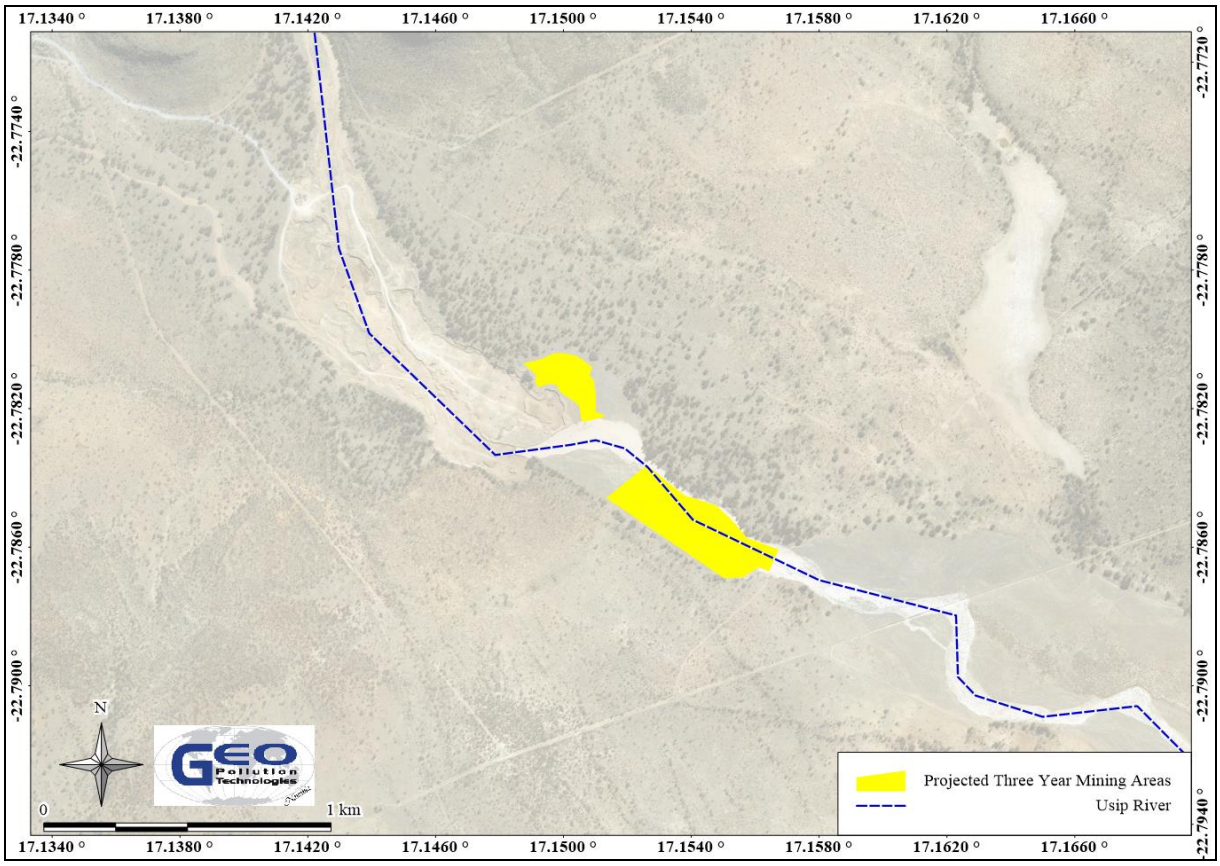


Figure 4. Targeted Mining Area over Next Three Years (Colmon Mining and Kunene Building Supplies Combined)

5 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an environmental assessment, as per the Namibian legislation. The legislation and standards provided in Table 1 and Table 2 govern the environmental assessment process in Namibia and/or are relevant to the development.

Table 1. Namibian Law Applicable to the Development

Law	Key Aspects
The Namibian Constitution	♦ Promote the welfare of people ♦ Incorporates a high level of environmental protection ♦ Incorporates international agreements as part of Namibian law
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	♦ Defines the environment ♦ Promote sustainable management of the environment and the use of natural resources ♦ Provide a process of assessment and control of activities with possible significant effects on the environment
Environmental Management Act Regulations Government Notice No. 28-30 of 2012	♦ Commencement of the Environmental Management Act ♦ List activities that requires an environmental clearance certificate ♦ Provide Environmental Impact Assessment Regulations
Soil Conservation Act Act No. 76 of 1969	♦ Provides for combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources
The Water Act Act No. 54 of 1956	♦ Remains in force until the new Water Resources Management Act comes into force ♦ Defines the interests of the state in protecting water resources ♦ Controls water abstraction and the disposal of effluent ♦ Numerous amendments
Water Resources Management Act Act No. 11 of 2013	♦ Provide for management, protection, development, use and conservation of water resources ♦ Prevention of water pollution and assignment of liability ♦ Not in force yet
Forest Act (Act 12 of 2001, Government Notice No. 248 of 2001)	♦ Makes provision for the protection of the environment and the control and management of forest fires ♦ Provides the licencing and permit conditions for the removal of woody and other vegetation as well as the disturbance and removal of soil from forested areas
Forest Regulations: Forest Act, 2001 Government Notice No. 170 of 2015	♦ Declares protected trees or plants ♦ Issuing of permits to remove protected tree and plant species
Local Authorities Act Act No. 23 of 1992, Government Notice No. 116 of 1992	♦ Define the powers, duties and functions of local authority councils ♦ Regulates discharges into sewers
Public Health Act Act No. 36 of 1919	♦ Provides for the protection of health of all people

Law	Key Aspects
Public and Environmental Health Act Act No. 1 of 2015, Government Notice No. 86 of 2015	♦ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters ♦ Deals with Integrated Waste Management including waste collection disposal and recycling; waste generation and storage; and sanitation.
Labour Act Act No 11 of 2007, Government Notice No. 236 of 2007	♦ Provides for Labour Law and the protection and safety of employees ♦ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)
Atmospheric Pollution Prevention Ordinance Ordinance No. 11 of 1976	♦ Governs the control of noxious or offensive gases ♦ Prohibits scheduled process without a registration certificate in a controlled area ♦ Requires best practical means for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process
Hazardous Substances Ordinance Ordinance No. 14 of 1974	♦ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export ♦ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings
Pollution Control and Waste Management Bill (draft document)	♦ Not in force yet ♦ Provides for prevention and control of pollution and waste ♦ Provides for procedures to be followed for licence applications

Table 2. Relevant Multilateral Environmental Agreements for Namibia and the Development

Agreement	Key Aspects
Stockholm Declaration on the Human Environment, Stockholm 1972.	♦ Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment
United Nations Framework Convention on Climate Change (UNFCCC)	♦ The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention
Convention on Biological Diversity, Rio de Janeiro, 1992	♦ Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity

Quarrying and related activities that are listed as activities requiring an environmental clearance certificate are (Government Notice No. 29 of 2012):

Mining and Quarrying Activities

- 3.2. Other forms of mining or extraction of any natural resource whether regulated by a law or not - Quarrying is a type of extraction method employed for sand resources.
- 3.3. Resource extraction, manipulation, conservation and related activities. - Quarrying is a type of extraction method employed for sand resources.

Forestry Activates

- 4. The clearance of forest areas, deforestation, timber harvesting or any related activity that required authorisation in terms of the Forest Act, 2001 (Act No 12 of 2001) or any other law. – De-bushing activities are required to adopt an environmental management plan for projects related to the scale of bush-clearing conducted by the proponent.

Additional national planning legislation considered include:

- 5th National Development Plan (NDP5),
- Harambee Prosperity Plan.

The Harambee Prosperity Plan (HPP) is a targeted action plan to accelerate development in clearly defined priority areas, which lay the basis for attaining prosperity in Namibia. The Plan does not replace, but complements the long-term goal of the National Development Plans (NDPs) and Vision 2030. The rationale behind the HPP is to introduce an element of flexibility in the Namibian planning system by fast tracking development in areas where progress is insufficient. It also incorporates new development opportunities and aims to address challenges that have emerged after the formulation of NDPs. It is the purpose of NDP5 to set out a roadmap for achieving envisioned rapid industrialization while adhering to the four integrated pillars of sustainable development as identified in the plan.

The first goal of the economic progression pillar of NDP5 is to achieve sustainable and equitable economic growth. NDP5 further aims at intensifying value addition as part of its mining strategies and to promote industries that will produce mining inputs and services. Operations of Henning Crusher are in line with all of these strategies as identified in the NDP5. The project, by supplying essential material to clients, also support the focus area of sustainable infrastructure, namely, transport and logistics which also features as a key development goal in NDP5.

6 ENVIRONMENTAL CHARACTERISTICS

This section lists the most important environmental characteristics of the study area and provides a statement on the potential environmental impacts on each.

6.1 Locality and Surrounding Land Use

The sand quarry is found in the Usip River on the farm Aris (No. 29) (Figure 1). Farm Aris is zoned for agricultural use and falls within the Aris Town Planning Scheme although it is now incorporated under the City of Windhoek municipal area (Figure 6). The site is surrounded by other farms, including the farm GocheGanas to the east and south, Krumhuk to the West and Waldeck to the northeast. The B1 highway is situated 1.2 km west of the sand mining operations. Colmon Mining has been given permission from the farm owner to mine sand on the property (Appendix A).

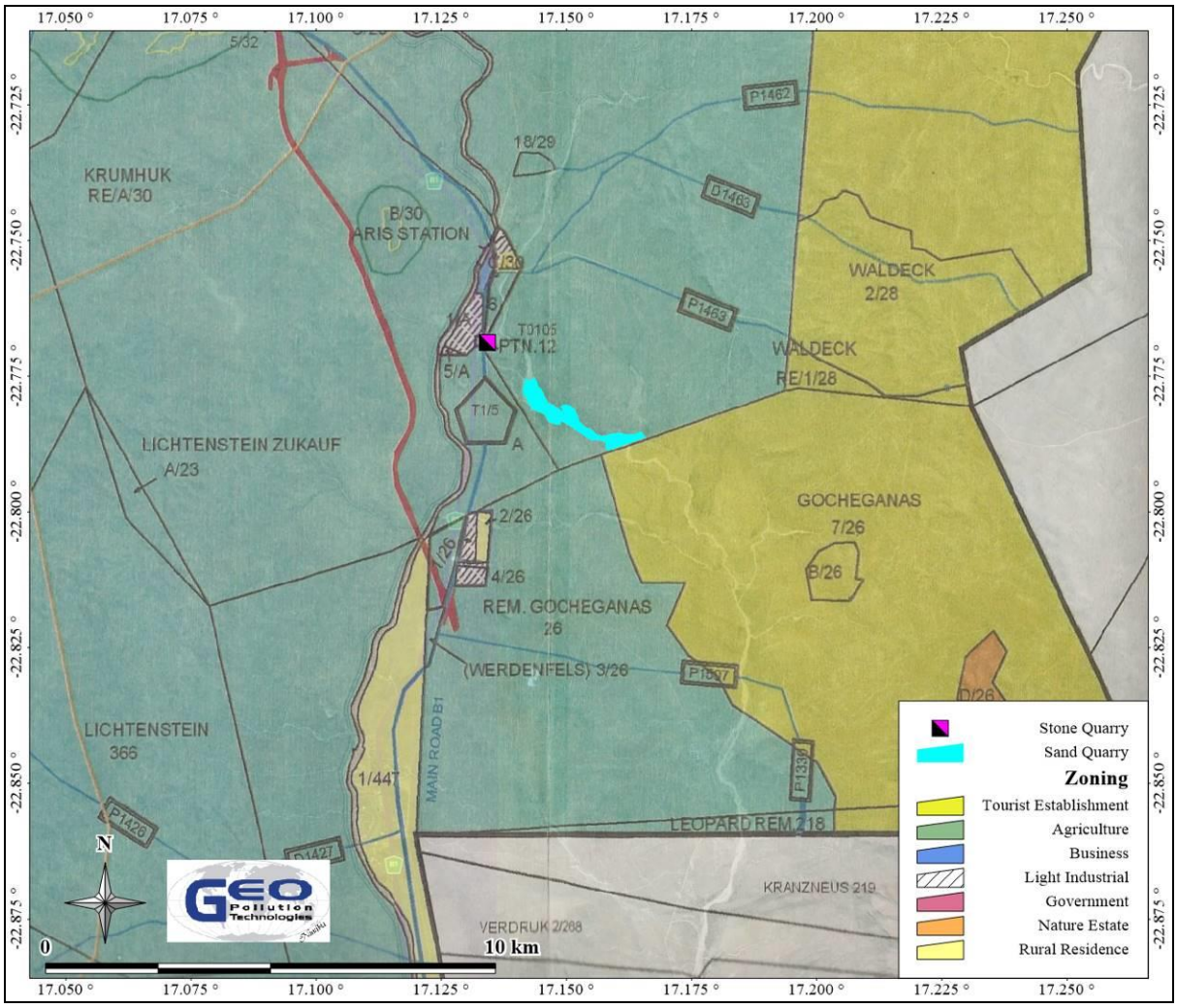


Figure 5. Land Use

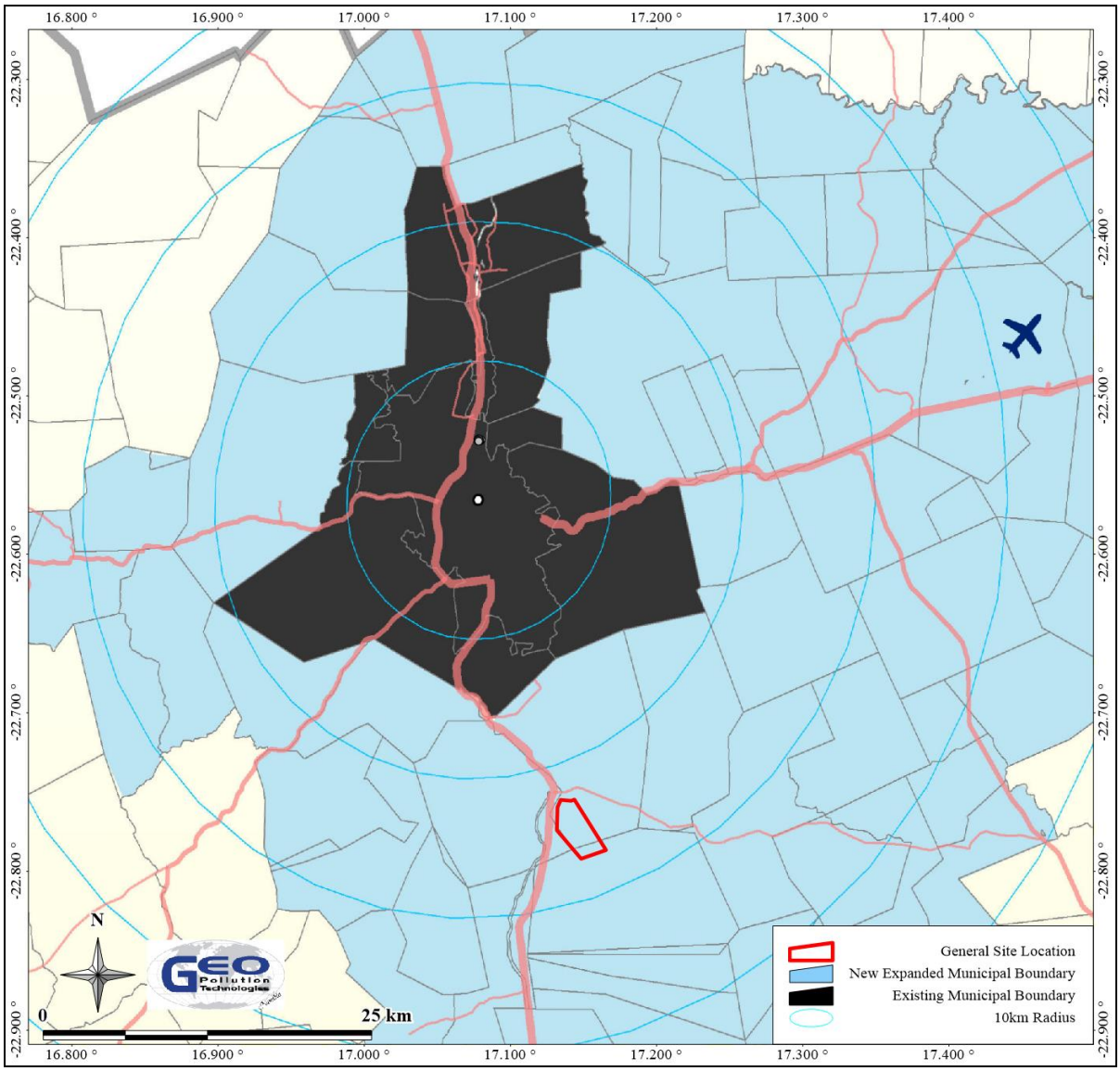


Figure 6. Old and New Expanded Municipal Boundaries of Windhoek

Implications and Impacts

The mine is situated on commercial privately owned farmland falling within municipal boundaries of the City of Windhoek. The owner of the farm has entered into an agreement with Colmon Mining which allows them to mine sand from the Usip River on his farm.

6.2 Climate

The sand mine is situated in a semi-arid highland savannah region. Heavy rainfall in this region is mostly common between January and March, peaking mostly in January, whilst May to September have little or no rainfall.

The aridity of the region causes water resources to be a scarce commodity that has to be conserved and protected from pollution. Groundwater is an important source of water in Namibia.

Table 3. Summary of Climate Data

Average annual rainfall (mm/a)	300-350
Variation in annual rainfall (%)	40-50
Average annual evaporation (mm/a)	3000-3200
Water deficit (mm/a)	1701-1900
Average annual temperatures (°C)	19-20

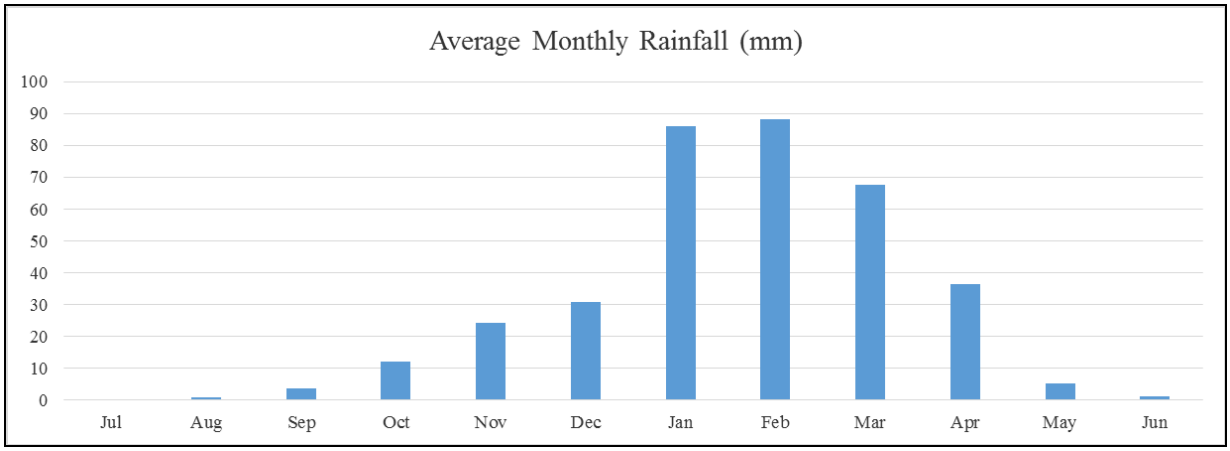


Figure 7. Rainfall and Temperature Information for the Aris Area (Atlas of Namibia)

Implications and Impacts

Water is a scarce and valuable resource in Namibia. Rainfall events are typically thunderstorms with heavy rainfall that can occur in short periods of time (cloud bursts). The extreme variability in seasonal rainfall makes water an extremely vulnerable resource.

Rainfall events may result in the leaching of pollutants or hazardous substances into groundwater. Soil and water pollution should be prevented.

Mining activities occurs within an ephemeral river and flash floods can occur which may endanger workers on site.

6.3 Topography and Surface Water

The site is located in the Khomas Hochland Plateau region which is defined by rolling hills to the west with many summit heights that reflect older land surfaces. Locally the topography can be described as relatively flat with a number of hills and mountains breaking through the flat surface.

The site is located on the northern edge of the catchment of the Auob River, an ephemeral river draining in an eastern direction (Figure 8). Although the local Usip River falls within the Auob River it does not contribute to the flow of the Auob River. Both the Oanob River (Usib River is a tributary of the Oanob River) and the Skaap Rivier terminates into a due field present between Kalkrand and Hoachanas.

Local drainage in the project area is controlled by the Usip River that flows through the flat terrain. At the site the Usip River flows through between two hills. The hill areas do have steeper slopes and higher risk of erosion can be expected around these areas, see Figure 9.

Figure 8. Regional Surface Drainage

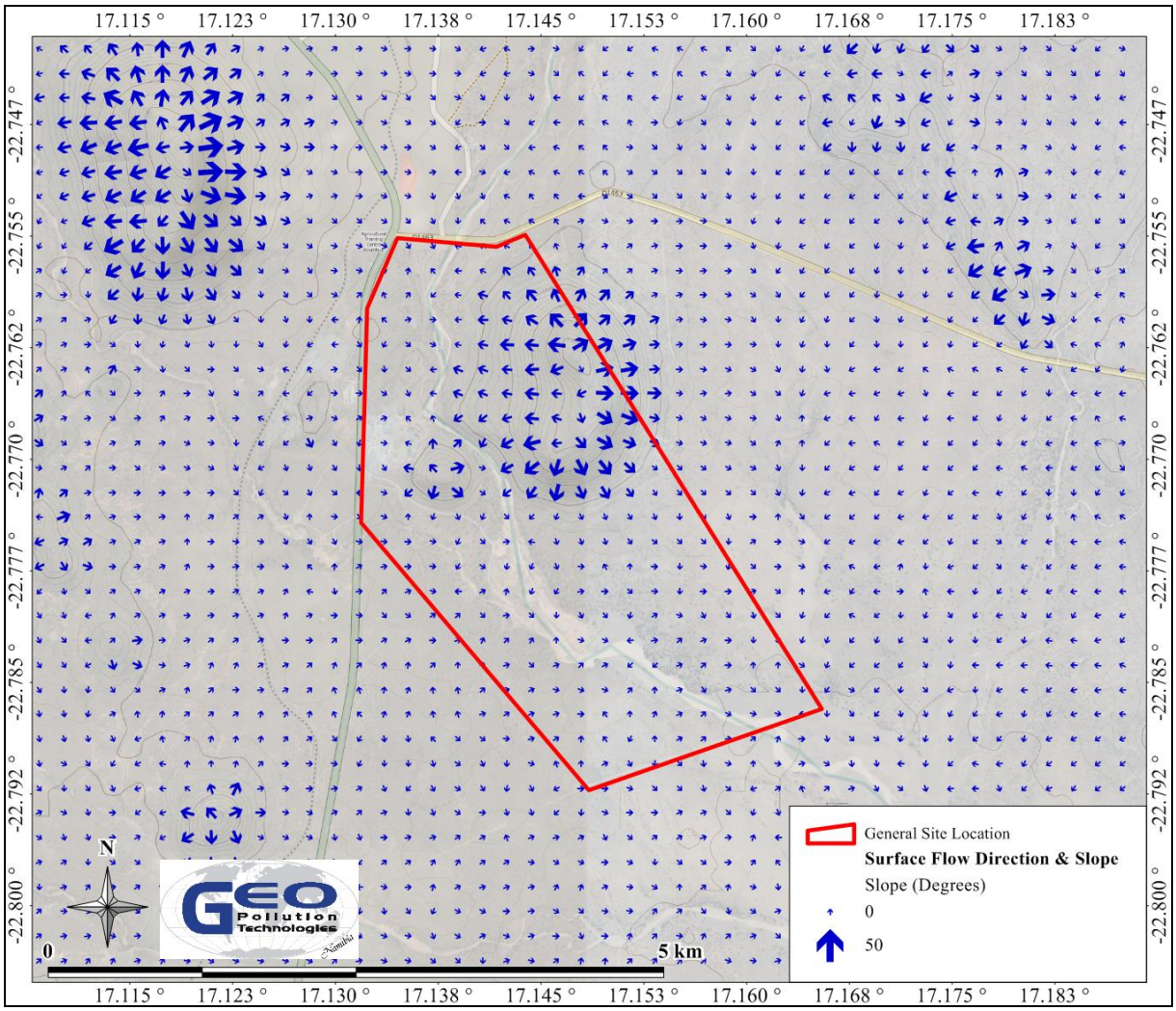


Figure 9. Surface Drainage area for the Sand Quarry

Implications and Impacts

The site is located within the catchment of the Auob River, an ephemeral river, draining is in an eastern direction. Heavy rainfall events may result in the leaching of pollutants or hazardous substances into groundwater or its transport to receptors downstream of the mine. Servicing of vehicles may not occur at the sand mine. Any pollutants or contaminated soil must be removed from site and disposed of in an appropriate manner.

Flash floods could be a threat if rainfall is heavy, as the site is situated in a river bed.

6.4 Geology and Hydrogeology

The dominant soil group in the area is eutric leptosols, which refer to a thin soil cover (<10cm) over hard rock. Soil cover at the site is from Quaternary Sediments (Qs). Underlying geology breaking through the surface cover is Para-/orthogneiss, metasedimentary rocks, granite and or metabasite dykes of Mokolian age from the Hohewarte Complex (Mho) with minor intrusions of pegmatites (Epe) of Cambrium age as well as phonolites (TsARp) and trachyte (TsARt) intrusions of Tertiary age, see Figure 11. The surface cover is predominantly present where the topography is relatively flat, with coarse grain material expected near the ephemeral rivers and finer grained material further away from these rivers. Several alkaline intrusions are also present in the form of trachyte and phonolite. The phonolites and trachyte occur as flows, dykes and plugs exposed as eroded outcroppings and caps on small hills and buttes.

The project location is situated in the South eastern Kalahari groundwater basin, near the northern boundary with the Okahandja Basin (Christelis, G. 2001), see Figure 10. Drainage of

groundwater in the South eastern Kalahari groundwater basin is mainly to the southeast and this basin form part of a transboundary aquifer, shared with Botswana. The City of Windhoek groundwater abstraction scheme is located within the Okahandja groundwater basin, characterise with groundwater flow mainly in a northerly direction. No impact on the City of Windhoek groundwater abstraction scheme is expected as the project is located in a different groundwater basin, draining away from the City of Windhoek groundwater abstraction scheme, see Figure 10.

Groundwater flow would be mostly through secondary porosity along fractures, faults and other geological structures present within the formations. The project area is located within the Windhoek Graben, characterised by roughly north-south striking faults, active since Tertiary times until today. Northeast-southwest structures, as well as east-west structures are also prominent.

Water is utilized in the area, with 17 known boreholes and a number of wells within a 5 km radius, see Table 4 and Figure 11. This area falls within the Windhoek-Gobabis Subterranean Water Control Area (Extension) - Government Notice 47 of 26 March 1976. The Aris Town Planning Scheme (December 2006) further stipulates in Section 9.2 that drilling or excavation for water is only allowed with the written consent of the Council and the Ministry of Agriculture, Water and Forestry.

Water quality in the area seems to be mostly of a good quality (Group A) with some boreholes located further south having a poorer quality, mostly due to the presence of high fluoride concentrations.

Depth to groundwater is expected to be more than 50 m below surface with shallower levels located along the Usip River. The groundwater flow direction, as inferred from historic water level data, suggests a flow direction in a southeast to southerly direction. Flow along preferred flow paths might be in different directions, but the larger scale flow is still expected to be in a southeast to southerly direction.

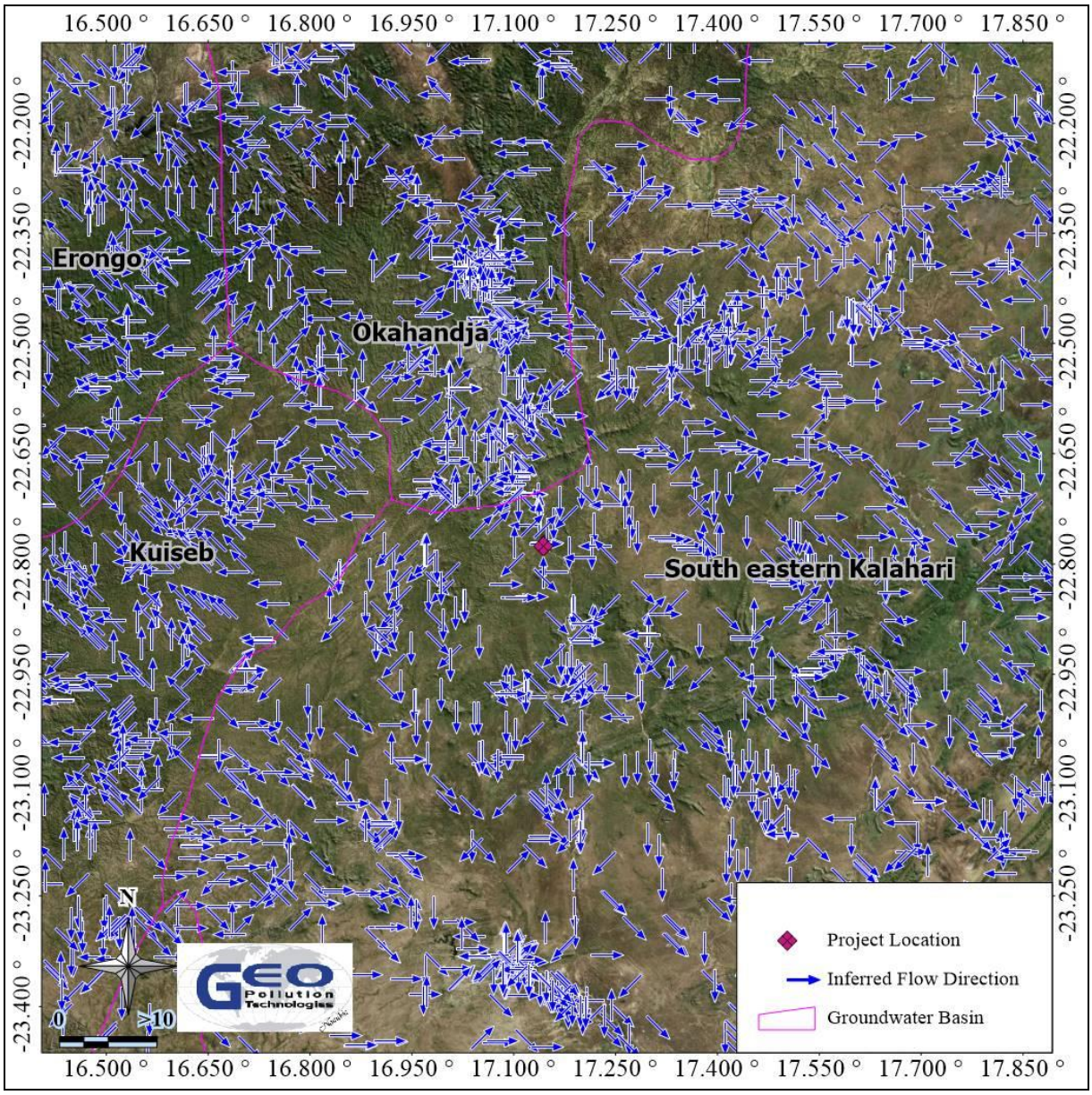
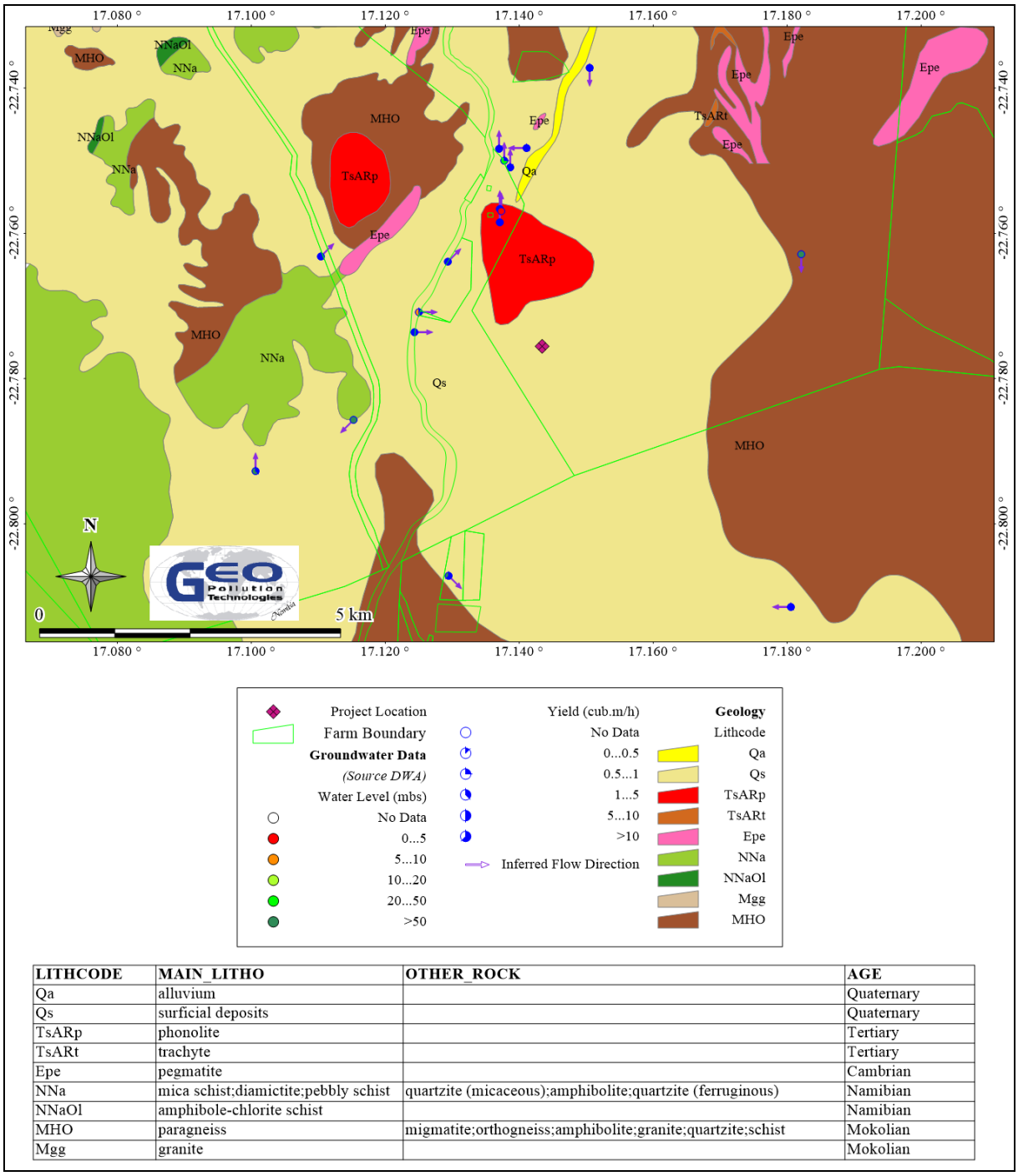


Figure 10. Project Location Relative to Groundwater Basins

Table 4. Groundwater statistics

Query Centre:	Usip River Sand Mining; -22.7756°S; 17.1434°E									Query Box Radius: 5.0km	
	NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (mbs)	YIELD (m3/h)	WATER LEVEL (mbs)	WATER STRIKE (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points	17			15	10	7	7	4	4	4	4
Minimum		-22.730604	17.094599	7	0	2	18	150	4	0	0
Average				78	4	46	68	163	6	2	0
Maximum		-22.820596	17.192201	170	12	116	116	188	7	4	0
Group A				33.33%	10.00%	28.57%	0.00%	100.00%	100.00%	100.00%	100.00%
Limit				50	>10	10	10	1000	200	10	1.5
Group B				40.00%	10.00%	42.86%	42.86%	0.00%	0.00%	0.00%	0.00%
Limit				100	>5	50	50	1500	600	20	2.0
Group C				26.67%	60.00%	14.29%	28.57%	0.00%	0.00%	0.00%	0.00%
Limit				200	>0.5	100	100	2000	1200	40	3.0
Group D				0.00%	20.00%	14.29%	28.57%	0.00%	0.00%	0.00%	0.00%
Limit				>200	<0.5	>100	>100	>2000	>1200	>40	>3



LITHCODE	MAIN_LITHO	OTHER_ROCK	AGE
Qa	alluvium		Quaternary
Qs	surficial deposits		Quaternary
TsARp	phonolite		Tertiary
TsARt	trachyte		Tertiary
Epe	pegmatite		Cambrian
NNa	mica schist;diamictite;pebbly schist	quartzite (micaceous);amphibolite;quartzite (ferruginous)	Namibian
NNaOl	amphibole-chlorite schist		Namibian
MHO	paragneiss	migmatite;orthogneiss;amphibolite;granite;quartzite;schist	Mokolian
Mgg	granite		Mokolian

Figure 11. Geology and Hydrogeology

Implications and Impacts

Groundwater is utilised in the area and such users would be at risk if pollution of the groundwater takes place. Permeable soil and shallow groundwater levels makes the groundwater vulnerable to pollution.

6.5 Public Water Supply

Public water is supplied from a number of boreholes operated by the respective property owners. No formal bulk water groundwater abstraction scheme is present nearby.

Implications and Impacts

Public water supply may be impacted if groundwater contamination takes place. Special care must be taken during the operations of the quarries.

6.6 Fauna and Flora

The project location falls within an ephemeral river, the Usip River, centrally within the highland savanna biome (Giess 1971). The vegetation type is classified as a highland shrubland (Mendelson et al. 2002). The alluvial plains surrounding the mining area are typically characterized by *Schmidtia kalahariensis* (Bushman grass) – *Acacia erioloba* (Camel-thorn) vegetation associations (Strohbach 2012).

Table 1 list the tree species that is expected to occur in the vicinity of the project location (Curtis & Mannheimer 2005). Seven of these are protected by forestry legislation and two are listed in Appendix II of The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Appendix II listed species are those which are not necessarily threatened with extinction, but requires some control to avoid over-utilization. Very few individuals of the species from Table 1 occurs in the riverbed of the Usip River. Where they do occur it is typically seedlings or young plants that germinated after the rainy season. The plants that are likely to occur in the riverbed, and as such are vulnerable due to sand mining, are annual herbs and grasses. Some of the expected herbs and grasses are presented in Table 2.

Large mammals occurring in the vicinity of the project location include kudu, oryx, warthog, baboon, jackal, cheetah and leopard. Smaller cats like caracal, small antelope like duiker, klipspringer and steenbok, hares, aardvark, pangolin, porcupine, honey badgers, mongoose, suricate, rock hyrax and ground squirrels also occur in the vicinity. A number of bird and reptile species occur in the surrounding areas. Animals present in the area will mostly be found outside of the riverbed in vegetated areas where they have shelter and food.

Table 5. General Flora Data (Atlas of Namibia)

Biome	Savanna
Vegetation type	Highland shrubland
Vegetation structure type	Dense shrubland
Diversity of higher plants	High (Diversity rank = 2 [1 to 7 representing highest to lowest diversity])
Number of plant species	400 - 500
Dwarf shrub height (m)	< 0.5
Percentage grass cover	26-50
Grass height (m)	< 0.5
Dominant plant species 1	*Acacia hereroensis*
Dominant plant species 2	*Combretum apiculatum*
Dominant plant species 3	*Acacia reficiens*
Dominant plant species 4	*Acacia hebeclada*
Dominant plant species 5	*Ziziphus mucronata*
Dominant plant species 6	*Rhus* species

Table 6. General Fauna Data (Atlas of Namibia)

Fauna	
Mammal Diversity	61 - 75 Species
Rodent Diversity	20 - 23 Species
Bird Diversity	201 - 230 Species
Reptile Diversity	71 - 80 Species
Snake Diversity	35 - 39 Species
Lizard Diversity	32 - 35 Species
Scorpion Diversity	18 - 21 Species

Table 7. Trees Expected to Occur in the Vicinity of the Project Location (Curtis & Mannheimer, 2005)

Scientific Name	Common Name	Expected Abundance	Status
Acacia erioloba	Camel-thorn	Common to Abundant	Protected by forestry legislation
Acacia hebeclada subsp *hebeclada*	Candle-pod Acacia	Common to Abundant	
Acacia hereroensis	Mountain-thorn	Common to Abundant	
Acacia karroo	Sweet-thorn	Common to Abundant	
Acacia luederitzii var *luederitzii*	Kalahari Acacia	Uncommon to Rare	
Acacia mellifera subsp *detinens*	Blue-thorn Acacia	Common to Abundant	Aggressive Invasive
Acacia reficiens subsp *reficiens*	Red-thorn	Occasional	Very aggressive invader
Acacia tortilis subsp *heteracantha*	Umbrella-thorn	Uncommon to Rare	
Albizia anthelmintica	Worm-cure Albizia	Occasional	Protected by forestry legislation
Aloe littoralis	Windhoek Aloe	Uncommon to Rare	CITES Appendix II
Boscia albitrunca	Shepherd's Tree	Common to Abundant	Protected by forestry legislation
Catophractes alexandri	Trumpet-thorn	Common to Abundant	Invasive in some areas
Combretum apiculatum subsp *apiculatum*	Kudu-bush	Common to Abundant	
Combretum imberbe	Leadwood	Common to Abundant	Protected by forestry legislation
Commiphora glandulosa	Tall Common Corkwood	Uncommon to Rare	None Recorded
Commiphora pyracanthoides	Fire Thorn Corkwood	Uncommon to Rare	None Recorded
Croton gratissimus		Occasional	
Dichrostachys cinerea subsp *africana*	Sickle-bush	Occasional	Invasive
Diospyros lycioides	Bluebush	Common to Abundant	
Dombeya rotundifolia	Wild Pear	Uncommon to Rare	
Ehretia alba	White-puzzle Bush	Uncommon to Rare	
Elephantorrhiza suffruticosa	Skew-leaved Elephant Root	Common to Abundant	
Euclea undulata var *myrtina*	Common Guarri	Occasional	
Euphorbia avasmontana	Slender Candelabra-euphorbia	Uncommon to Rare	CITES Appendix II
Ficus ilicina	Rock-splitting Fig	Uncommon to Rare	
Grewia bicolor var *bicolor*	Two-coloured Raisin-bush	Uncommon to Rare	
Grewia flava	Velvet Raisin	Common to Abundant	
Grewia flavescens	Sandpaper Raisin	Occasional	
Lantana angolensis	Lantana	Uncommon to Rare	

Leucosphaera bainesii	Wool bush	Common to Abundant	
Lycium bosciifolium	Limpopo Honey-thorn	Occasional	
Lycium eenii	Broad-leaved Honey-thorn	Common to Abundant	
Lycium hirsutum	River Honey-thorn	Common to Abundant	
Maerua schinzii	Ringwood Tree	Common to Abundant	Protected by forestry legislation
Manuleopsis dinteri	Dinter's Bush	Common to Abundant	
Montinia caryophyllacea	Wild Clove-bush	Common to Abundant	
Nicotiana glauca	Wild Tobacco	Occasional	Alien
Osyris lanceolata-quadripartita	African sandalwood	Uncommon to Rare	
Otoptera burchellii	N/A	Occasional	
Ozoroa crassinervia	Namibian Resin-tree	Uncommon to Rare	Near-endemic stretching into Richtersveld
Pechuel-Loeschea leubnitziae	Stinkbush	Common to Abundant	
Phaeoptilum spinosum	Brittle-thorn	Common to Abundant	
Prosopis spp.	Prosopis	Uncommon to Rare	Alien invasive
Rhigozum brevispinosum	Simple-leaved Rhigozum	Common to Abundant	
Rhigozum trichotomum	Three-thorn Rhigozum	Occasional	
Searsia lancea	Willow Rhus	Occasional	Protected by forestry legislation
Searsia marlothii	Bitter Karee	Common to Abundant	
Searsia pyroides	Common Currant	Unknown	
Searsia tenuinervis var *tenuinervis*	Kalahari Currant	Common to Abundant	
Steganotaenia araliacea var *araliacea*	Carrot-tree	Uncommon to Rare	
Tarchonanthus camphoratus	Camphor Bush	Common to Abundant	
Ziziphus mucronata	Buffalo-thorn	Occasional	Protected by forestry legislation

Table 8. Herbs and Grasses Expected to Occur in the Vicinity of the Project Location (Strohbach 2012; http://herbaria.plants.ox.ac.uk/)

Scientific Name	Common Name
Anthephora pubescens	Wool grass
Anthephora schinzii	Wool grass
Brachiaria nigropedata	Black-footed Brachiaria
Digitaria eriantha	Finger-grass
Enneapogon cenchroides	Fur grass
Eragrostis lehmanniana	Common love grass
Eragrostis porosa	Lovegrass; Soetgras
Geigeria pectida	Common geigeria
Kyllinga alata	White button sedge
Kyphocarpa angustifolia	Silky Burweed
Melinis repens subs *grandiflora*	Red-top grass
Nidorella resedifolia	John Deere Flower / Nesterkraut
Ocimum americanum var *americanum*	Wild basil
Pogonarthria fleckii	Hairy fishbone grass
Schmidtia kalahariensis	Bushman grass
Stipagrostis uniplumis	Silky Bushman grass

Implications and Impacts

Since mining of sand occurs within the riverbed there are no large trees or shrubs present. Vegetation being removed is mainly limited to some annual grasses and small herbaceous plants. If trees have to be removed it must be ascertained that they are not protected by forestry legislation and if they are, all necessary permits from the Ministry of Agriculture, Water and Forestry must be obtained.

6.7 Demographic Characteristics

The project area falls within the Khomas Region and lies to the south of Windhoek. The Khomas Regions population consists of about 332,300 people (see Table 9) (National Planning Commission, 2012).

Table 9. Demographic Characteristics of Windhoek, the Khomas Region and Nationally (Namibia Statistics Agency, 2014; Namibia Statistics Agency, 2009/2010)

	Windhoek	Khomas Region	Namibia
Population (Males)	159,600*	164,600	1,021,912
Population (Females)	162,800*	167,700	1,091,165
Population (Total)	322,500	332,300	2,113,077
Unemployment (15+ years)	N/A	21.7%	33.8%
Literacy (15+ years)	N/A	95.7%	87.7%
Education at secondary level (15+ years)	N/A	60.4%	51.2%
Households considered poor	N/A	5.8%	19.5%

*Data available from preliminary results only (National Planning Commission, 2012)

Implications and Impacts

Unemployment and poverty in the Khomas Region is relatively high. The sand quarry plays a role in providing employment to people from the area and sustains the construction industry in the region which provides employment to thousands of people.

7 PUBLIC CONSULTATION

Consultation with the public forms an integral component of an EIA investigation and enables I&APs e.g. neighbouring landowners, local authorities, environmental groups, civic associations and communities, to comment on the potential environmental impacts associated with the mining operations and to identify additional issues which they feel should be addressed in the EIA.

Public participation notices were advertised twice in the national papers: The Namibian as well as in Die Republikein on the 27th of April and the 5th of May 2015 respectively. The environmental section of the Windhoek Town Council, neighbouring farm owners, and the Directorate of Water Affairs were invited directly. A list of I&APs who were invited and consulted with as well as those who registered as I&APs are presented in Appendix B. Public consultation, and all communication received from registered I&Aps, are presented in a separate accompanying document. The following is a summary of the main concerns expressed:

Since 2009, Japonica Investments Nineteen (Pty) Ltd and Namibia Estate Enterprises (Pty) Ltd:have been planning the development of high class developments on farm GocheGanas. Both the developments Kanonkop and Camelthorn, as well as the existing lodge, GocheGanas Nature Reserve and Wellness Village, are said to be negatively affected by certain factors of the ongoing sand mining processes of the Aris sand mining project. Factors include dust, and noise as a result of excavation of sand, screening and loading onto trucks for transport. The mining processes are also said to spoil the view for all three developments and would thus negatively impact on their success.

Concerns were raised by the African Christian Support Mission Trust (ACSM Trust) on the legality of the sand mining processes that are taking place in the Usip River on farm Aris. The ACSM Trust is also concerned about the negative effects that the mining on farm Aris will have on their own mining processes in Groot Aub, stating that the local community at Groot Aub is supported by the proceeds from the mining of sand and other activities planned for in the area of Groot Aub. The Usip River runs in a southerly direction from Farm Aris to join with the Groot Aub River situated to the south of Farm Aris. The ACSM Trust have expressed concern that their future agronomic plans at their concessionary site will be hampered due to the mining processes taking place in the Usip River on Farm Aris. They fear that the water in the river may either be depleted or polluted as a result of the mining areas at farm Aris.

8 MAJOR IDENTIFIED IMPACTS

During the scoping exercise a number of environmental impacts have been identified. The following section provides a brief description of the most important of these impacts.

8.1 Ecosystem Impacts

If the mining is restricted to the river bed there will be very little ecosystem impacts that can be expected. However, if the mining processes start to alter the course of the river or if erosion becomes significant, ecosystem impacts may be expected.

8.2 Safety Impacts

Open quarries pose a threat to both humans and wildlife. This is especially the case where quarries have steep sides and where quarrying is done to the depth of the water table and water accumulates in open trenches. The quarry is on private land and access is restricted. However, clients do collect sand themselves.

People that walk within the vicinity of the quarries may fall in and hurt themselves. There is also the possibility that animals in the area may fall in the quarries.

8.3 Groundwater Surface Water and Soil Contamination

In terms of vulnerability of the soil and groundwater there is one main feature of importance. The sandy soils of the area are prone to high levels of leaching. The water table is relatively shallow along the Usip River in the sediments and significantly deeper in the hard rock. It is important to note that there are two main factors that may impact on groundwater and soil. These are 1) spilling of fuel, oil or hydraulic fluids when earthmoving equipment are refuelled or repaired on site; and 2) should groundwater be exposed, increased salinity of stagnant water in quarries due to continuous evaporation.

8.4 Traffic Impacts

Tipper trucks and other slow moving earthmoving equipment traveling to and from the site on the B1 highway pose risks to regular traffic and may increase the likelihood of accidents and injuries.

8.5 Dust and Air Quality

Trucks collecting sand as well as the process of excavation and screening of sand may result in dust. This will be aggravated during periods of strong winds.

8.6 Noise

Trucks, excavators and power screens will cause noise which can negatively impact on workers on site and depending on prevailing winds impact on nearby receptors.

8.7 Natural River Diversion

No river diversion is expected to occur since mining of sand will take place as a surface stripping exercise, thus not requiring river diversion. Mining will only take place when there is no flow in the river, thus no flow diversion would be required. The river banks will also not be mined in a way that will cause a deviation of the natural surface flow from the main river channel.

8.8 Alteration of a Natural Wetland

The river is not regarded as a natural wetland and no permanent surface water is present. It is an ephemeral river that flows very infrequently. Some surface pooling takes place during the rainy season. No fauna and flora communities are present that relies on a permanent source of surface water.

9 ASSESSMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts and provides possible mitigation measures that are expected from the operational and decommissioning activities of the sand mine. The following summarise some impacts identified, following the site reconnaissance visits and from comments received from I&APs.

- Groundwater, surface water and soil contamination
- Fire
- Noise impacts
- Dust
- Traffic impacts
- Socio-economic impacts
- Health & safety impacts
- Security impacts
- Cumulative impacts

These identified impacts will be assessed and evaluated in different phases of the development. Mitigation measures are also proposed for different impacts. There are specific policies and guidelines that address environmental issues related to the development. The policies and guidelines were referred to in the legal section.

The Rapid Impact Assessment Method (Pastakia, 1998) will be used during the assessment. Ranking formulas are calculated as follow:

A = A1 x A2
B = B1 + B2 + B3
Environmental Classification (ES) = A x B

The Environmental Classification of impacts are provided in Table 10 while the assessment criteria is provided in Table 11 and Table 12.

Table 10. Environmental Classification of Impacts according to the Rapid Impact Assessment Method of Pastakia 1998.

Environmental Classification (ES)	Class Value	Description of Class
72 to 108	5	Extremely positive impact
36 to 71	4	Significantly positive impact
19 to 35	3	Moderately positive impact
10 to 18	2	Less positive impact
1 to 9	1	Reduced positive impact
0	-0	No alteration
-1 to -9	-1	Reduced negative impact
-10 to -18	-2	Less negative impact
-19 to -35	-3	Moderately negative impact
-36 to -71	-4	Significantly negative impact
-72 to -108	-5	Extremely Negative Impact

Table 11. Assessment Criteria

Criteria	Score
Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect	
Importance to national/international interest	4
Important to regional/national interest	3
Important to areas immediately outside the local condition	2
Important only to the local condition	1
No importance	0
Magnitude of change/effect (A2) – measure of scale in terms of benefit / disbenefit of an impact or condition	
Major positive benefit	3
Significant improvement in status quo	2
Improvement in status quo	1
No change in status quo	0
Negative change in status quo	-1
Significant negative disbenefit or change	-2
Major disbenefit or change	-3
Permanence (B1) – defines whether the condition is permanent or temporary	
No change/Not applicable	1
Temporary	2
Permanent	3
Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition	
No change/Not applicable	1
Reversible	2
Irreversible	3
Cumulative (B3) – reflects whether the effect will be a single direct impact or will include cumulative impacts over time, or synergistic effect with other conditions. It is a means of judging the sustainability of the condition – not to be confused with the permanence criterion.	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

Table 12. Criteria for Impact Evaluation (Directorate of Environmental Affairs, 2008)

Risk Event	**Description of the risk that may lead to an impact.**
Probability	Refers to the probability that a specific impact will happen following a risk event. **Improbable** (low likelihood) **Probable** (distinct possibility) **Highly probable** (most likely) **Definite** (impact will occur regardless of prevention measures)
Confidence Level	The degree of confidence in the predictions, based on the availability of information and specialist knowledge. **Low** (based on the availability of specialist knowledge and other information) **Medium** (based on the availability of specialist knowledge and other information) **High** (based on the availability of specialist knowledge and other information)
Significance (no mitigation)	**None** (A concern or potential impact that, upon evaluation, is found to have no significant impact at all.) **Low** (Any magnitude, impacts will be localised and temporary. Accordingly the impact is not expected to require amendment to the project design.) **Medium** (Impacts of moderate magnitude locally to regionally in the short term. Accordingly the impact is expected to require modification of the project design or alternative mitigation.) **High** (Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly the impact could have a 'no go' implication for the project unless mitigation or re-design is practically achievable.)
Mitigation	Description of possible mitigation measures
Significance (with mitigation)	**None** (A concern or potential impact that, upon evaluation, is found to have no significant impact at all.) **Low** (Any magnitude, impacts will be localised and temporary. Accordingly the impact is not expected to require amendment to the project design.) **Medium** (Impacts of moderate magnitude locally to regionally in the short term. Accordingly the impact is expected to require modification of the project design or alternative mitigation.) **High** (Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly the impact could have a 'no go' implication for the project unless mitigation or re-design is practically achievable.)

The following tables evaluate the identified impacts, both positive and negative, of the sand mining activities on the environment. This includes the social, economic and natural environment affected by the activities on site.

9.1 Operational Phase

The operational phase will consist of and include the actual mining operations of the sand quarry as well as related activities. Specific impacts identified, associated with the operational phase are summarised in Table 13 to Table 26.

Table 13. Operational Impact - Skills, Technology & Development

Nature of impact		Enhanced skills and technology transfer to the Khomas Region.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
3	1	3	1	3	3	7	21
Probability		**Highly Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Low** (if Namibian contractors are not used)					
Mitigation/ Enhancement		Colmon Mining must employ local Namibians where possible. Deviations from this practice should be justified appropriately.					
Significance (with mitigation)		**Medium**					

Table 14. Operational Impact – Employment

Nature of impact		Employment					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
2	1	2	2	3	2	7	14
Probability		**Definite**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Low** (if local Namibians are not employed)					
Mitigation/ Enhancement		Where skills exist local Namibians must be employed. Deviations from this must be justified.					
Significance (with mitigation)		**Medium**					

Table 15. Operational Impact – Traffic

Nature of impact		Increased possibility of accidents at the main road junction due to tipper trucks. Damage other to vehicles due to stones/sand falling from tipper trucks on main road.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
2	-1	2	2	1	-2	5	-10
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		The turnoff from B1 Main Road should be placed at the highest elevation to ensure maximum visibility of oncoming traffic and turning trucks. Signs to be placed at junction warning oncoming traffic of trucks.					
Significance (with mitigation)		**Low**					

Table 16. Operational Impact – Fire

Nature of impact		Outbreak of an uncontrolled fire - manmade fires.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
3	-2	2	2	1	-6	5	-30
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		Open fires should not be allowed at the quarries, except at designated areas.					
Significance (with mitigation)		**Low**					

Table 17. Operational Impact – Health, Safety & Security

Nature of impact		The risk of accidents or injuries due to incorrect use of heavy machinery, as well as the non-use of PPE.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
1	-2	2	2	1	-2	5	-10
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		All Health and Safety standards specified in the Labour Act should be complied with. Ensure that all staff members are briefed about the potential risks of injuries on site. ♦ Qualified operators to work with heavy machinery. ♦ Adhere to Health and Safety Regulations pertaining to personal protective clothing, first aid kits being available on site, warning signs, etc.; ♦ Selected personnel should be trained in first aid. The contact details of all emergency services must be readily available. ♦ Equipment that will be locked away on site must be placed in a way that does not encourage criminal activities (e.g. theft). ♦ Access to the site should always be strictly controlled.					
Significance (with mitigation)		**Low**					

Table 18. Operational Impact – Dust Pollution

Nature of impact		Excessive dust generated from the movement of heavy vehicles to and from the site, as well as the excavation and screening of sand. This could be aggravated during periods of strong winds.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
2	-1	2	2	1	-2	5	-10
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Low**					
Mitigation/ Enhancement		Personnel issued with dust masks and dust suppression if required.					
Significance (with mitigation)		**Low**					

Table 19. Operational Impact – Noise Pollution

Nature of impact		Noise as a result of operations of trucks and heavy machinery may lead to hearing loss in operators of such machinery.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
1	-1	3	3	1	-1	7	-7
Probability		**Highly Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		Follow World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment and a nuisance to nearby residences. Personnel working in noisy environments must be issued with hearing protectors. Make use of broadband white noise' audible warning systems on excavators instead of normal audible warning systems. All vehicles and power screens to be maintained and serviced regularly to reduce noise impacts.					
Significance (with mitigation)		**Low**					

Table 20. Operational Impact – Waste Production

Nature of impact		Any waste which can include hazardous waste, such as hydrocarbons, or domestic waste.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
1	-1	2	2	2	-1	6	-6
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		All waste produced on site must be removed and disposed of at a recognised disposal facility. Temporary ablution facilities should be erected on site.					
Significance (with mitigation)		**Low**					

Table 21. Operational Impact – Ecosystem and Biodiversity Impact

Nature of impact		The impact on the ecological environment from the sand mining processes.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
3	-2	3	2	2	-6	7	-42
Probability		**Definite**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement (Elaborated on in the EMP)		Mining in the sand quarry must be limited to the riverbed and sandbanks outside of the tree line. A buffer outside of the tree line must be maintained where no mining may be allowed. This will protect tree root systems and prevent collapse of the river bank and trees. The buffer should be calculated as the distance away from the tree trunk equal to 1.5 times the radius of each individual tree's canopy. Where protected tree species have to be removed, this action should be justified and the necessary permits from the Ministry of Agriculture, Water and Forestry must be obtained. A permit as prescribed by the Water Act of 1956 is required in all instances where the flow of a river is altered or interfered with. Erosion damage to existing roads and adjacent land as a result of sand mining activities should be prevented. Restore the sites as close as possible to its original state immediately after mining.					
Significance (with mitigation)		**Low**					

Table 22. Operational Impact – Illegal Hunting and Poaching of Wild Animals and Plant Material

Nature of impact		Illegal Hunting and Poaching of Wild Animals and Plant Material					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
3	-2	2	2	2	-6	6	-36
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement (Elaborated on in the EMP)		All employees should be educated about the value of biodiversity. Strict conditions prohibiting harvesting and poaching of fauna and flora should be part of employment contracts. Disciplinary actions to be taken against all employees failing to comply with contractual conditions.					
Significance (with mitigation)		**Low**					

Table 23. Operational Impact – Groundwater, Surface Water and Soil Contamination

Nature of impact		Leakages from earthmoving vehicles and accidental fuel, oil or hydraulic fluid spills. Salinization of soil and ground water as a result of standing water where quarries reach the water table.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
2	-2	2	2	1	-4	5	-20
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement (Elaborated on in the EMP)		All vehicles must be serviced and maintained regularly. Vehicles may not be serviced at the quarry. Spill control by making use of drip trays if there is a need to repair machinery on site. All hydrocarbon based waste must be removed from site and disposed of at a recognised hazardous waste disposal facility. Any polluted soil or water to be treated as a hazardous waste. Mined out quarries with stagnant water must be rehabilitated and overburden returned immediately after mining to prevent exposed, stagnant water.					
Significance (with mitigation)		**Low**					

Table 24. Operational Impact – Heritage

Nature of impact		The discovery of archaeologically or culturally important sites.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
4	-1	3	3	1	-4	7	-28
Probability		**Improbable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		If such a site or any other archaeologically important artefact is found during the operational phase any work in that area must be halted and the relevant authorities must be informed. Firstly, the Namibian Police must be informed. Secondly, the National Monuments Council dealing with heritage should be informed. Mining may only continue at that location once permission has been granted.					
Significance (with mitigation)		**Low**					

Table 25. Operational Impact – Visual Impact

Nature of impact		This is an impact that affects the aesthetic appearance of the site being mined.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
1	-1	2	2	1	-1	5	-5
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		No dumping of waste should be allowed on site. Ensure rehabilitation of mined out areas occur without delay in order to improve aesthetic appearance.					
Significance (with mitigation)		**Low**					

Table 26. Operational Impact – Cumulative Impact

Nature of impact		The Cumulative Impacts are based on the fact that not only one company is making use of the quarry, therefor cumulative impacts may occur, and these consists of a combination of traffic, waste, dust and pollution impacts.					
Importance of Condition (A1)	**Magnitude of Change/Effect (A2)**	**Permanence (B1)**	**Reversibility (B2)**	**Cumulative (B3)**	**A**	**B**	**ES**
3	-1	2	2	1	-3	5	-15
Probability		**Probable**					
Degree of Confidence in Predictions		**High**					
Significance (without mitigation)		**Medium**					
Mitigation/ Enhancement		Adhering to all other mitigation measures listed in the EIA and the EMP to mitigate all negative impacts caused by the mining processes.					
Significance (with mitigation)		**Low**					

As depicted in the tables above, impacts related to the operational phase are expected to mostly be of medium significance but can mostly be mitigated to have a low significance. The extent of impacts are mostly site specific to local and are not of a permanent nature. Cumulative impacts are mostly of low likelihood. An Environmental Management Plan (EMP) will ensure that the impacts of the operational phase are minimised and include measures to reduce the identified impacts during the operation of the mining activities while ensuring that the local environment is rehabilitated and employees working on site are suitably protected to avoid accidents and injuries.

Table 27. Summary of Operational Impacts Prior to Mitigation (refer to Table 10 for explanation of class values)

Impact Category	Impact Type	Class Value
BE	Waste Production	-1
BE	Ecosystem and Biodiversity Impact	-4
BE	Poaching, Hunting or Removal of Plant Material	-4
EO	Fire	-3
PC	Dust Pollution	-2
PC	Groundwater, Surface Water and Soil Contamination	-3
SC	Skills, Technology & Development	3
SC	Employment	2
SC	Traffic	-2
SC	Health, Safety & Security	-2
SC	Noise	-1
SC	Visual Impact	-1
SC	Heritage Impact	-3
	Cumulative Impact	-2

BE = Biological/Ecological EO = Economical/Operational PC = Physical/Chemical SC = Sociological/Cultural

9.2 Decommissioning Phase

The impacts associated with this phase include health and safety risks, as well as ecosystem and biodiversity impacts. All safety procedures are to be followed strictly to prevent any harm to humans and animals in the area. In terms of rehabilitation, all mined out quarries must be rehabilitated and overburden returned immediately. The Environmental Management Plan for this phase will have to be reviewed at the time of decommissioning to cater for changes made to the mining procedures.

10 ALTERNATIVES TO THE PROPOSED DEVELOPMENT

No alternative sites are recommended for the sand mining processes. The sand mining quarry has already been in operation for approximately 45 years. It is best that processes remain in this area as relocating the sand mine to a new area would create new impacts in an otherwise pristine environment compared to the already disturbed current location. If Colmon Mining remain mining sand only within the riverbed and on sand banks with no tree cover, and adhere to the EMP, there is no immediate and serious threat to the environment, (that is not restorable), that can be identified. In order to ensure sand is available to the construction industry in Windhoek and the surrounding region it is important that Colmon Mining receives environmental clearance to operate the sand mine.

To reduce noise impacts the audible warning signals triggered when backing of excavators can be replaced by broadband white noise' systems instead.

11 POST MINING REHABILITATION

Restoration of mined out areas is an ongoing process that occurs throughout the life of the mine. As sections of river is mined out, rehabilitation of those sections must be performed. Since sand is removed from the mining site which constitutes a riverbed, rehabilitation will involve landscaping and return of topsoil rather than complete restoration of the mining sites. The aims of rehabilitation will be to:

- Prevent pooling or damming of water during rain events or when the river flows and ensure free flow of water to downstream users.
- Eliminate steep slopes which can present a risk to humans and wildlife.
- Ensure erosion of river banks are minimized.
- Reduce turbulence of water when the river flows and subsequently reduce turbidity.
- To return top soil to river banks and higher lying areas for the re-establishment of vegetation that will further prevent erosion.

11.1 Prior to Mining

Rehabilitation will be a relatively simple exercise which will start with the removal of topsoil prior to mining. Topsoil must be stored in piles in areas where it will not wash or blow away. It should also not be stored in areas where its storage will increase the amount of damage on the environment (for example within tree line on river bank). Topsoil may not be stored in such a way as to cause river diversion.

11.2 During Mining

Rehabilitation will continue throughout mining and the mining procedure will form part of the rehabilitation process. Pocket mining must be avoided and an approach of systematic strip mining should rather be followed. This will prevent the pooling or damming of water, prevent steep slopes and reduce erosion during river flow events. It will also reduce the amount of post mining rehabilitation needed.

11.3 Post Mining

Once an area has been mined out sloping of the area using earthmoving equipment should be performed. Any remaining steep slopes must be landscaped to gentle slopes and any pockets must be filled. Stored topsoil should be returned to area where vegetation is likely to establish (i.e. areas with limited water flow). Once the mining site is mined out, all roads that will not be functioning as part of the future use of the land must be ripped to loosen soil and allow vegetation to re-establish. All waste must be removed from site and any polluted soil must be disposed of at an appropriate disposal facility or be remediated.

Rehabilitated areas must be monitored continuously in order to ensure erosion does not occur. Any instances of erosion as a result of mining activities must be stopped and remediated with

anti-erosion measures such as planting of vegetation or using rocks or other suitable material as scour protection.

11.4 Responsibility

The responsibility of rehabilitation lies entirely with the proponent, although a specialist restoration ecologist can be appointed to prepare and regularly update a complete restoration plan as well as monitor restoration progress. For rehabilitation, earthmoving equipment operators must be instructed on correct rehabilitation measures.

11.5 Monitoring

A report must be compiled every six months of all areas mined and rehabilitated. This should include the surface area of such rehabilitated portions, rehabilitation methods as well as photographs of areas prior to mining, post mining and post rehabilitation.

12 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) provides management options to ensure impacts of the sand mining operations are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary. The EMP acts as a stand-alone document, which can be used during the various phases (operational and decommissioning) of the mining processes. All personnel taking part in the operations of the sand mines should be made aware of the contents of the EMP, so as to plan the operations accordingly and in an environmentally sound manner. An EMP for the operational and decommissioning phases of the project has been drafted and is available as a separate document.

The objectives of the EMP are:

- to include all components of the development and operations of the project;
- to prescribe the best practicable control methods to lessen the environmental impacts associated with the operations of the project;
- to monitor and audit the performance of operational personnel in applying such controls; and
- to ensure that appropriate environmental training is provided to responsible operational personnel.

Colman Mining could implement an Environmental Management System (EMS) for its operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- A stated environmental policy which sets the desired level of environmental performance;
- An environmental legal register;
- An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- Identification of environmental, safety and health training needs;
- An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy; and
- Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- The Environmental Management Plan.

13 CONCLUSION

The sand mining operations of Colmon Mining plays a positive role in the Khomas Region due to job creation and decreasing unemployment. The use of the land for sand mining has a beneficial role in generating income in the region and providing sand, a raw material crucial to the construction industry.

Operational related impacts must be prevented or mitigated by implementing strict monitoring and control. All permits and approvals must be obtained from relevant ministries or authorities for the operations of the sand mine. Fire prevention measures should be adequate to prevent fires that may potentially damage biodiversity, grazing and be a risk to human health. Health, safety and security regulations should be adhered to in accordance with the regulations pertaining to relevant laws and standards. The areas being quarried are on private land and no need for additional fencing is required, but warning signs prohibiting access to the mining areas should be present. Educating workers on the importance of conservation of the environment would prevent or minimize problems associated with poaching or illegal harvesting of plants.

The Environmental Management Plan should be used as an on-site reference document during all phases of the mining operations. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken.

14 REFERENCES

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Windhoek Meteorological Services, 2010-2011; Climate Data.

APPENDIX A: Letter of Agreement for Mining Activities to take place on Farm Aris (No. 29)

H.H. & M. L. Frowerk

Farm Aris # 29

P.O. Box 20538

Tel: +264 61 231939 / +264 81 124 01 35

Windhoek

Namibia

F W J Carsten t/a Colman Mining

P.O. Box 6589

Windhoek

Namibia

Leasing Agreement on Farm Aris # 29

To whom it may concern,

We hereby confirm that a lease agreement is in place with F W J Carsten t/a Colman Mining which includes the right for sand and stone quarrying on Farm Aris # 29, Windhoek district.

Yours sincerely

H.H. Frowerk

M.L. Frowerk

APPENDIX B: List of Notified, Consulted and Registered Interested and Affected Parties

Notified Parties

Name	Organisation
Kat Briedenhann	Farm Waldeck
Fred Koujo	Environmental Section, City of Windhoek
Ulf-Dieter Voigts / Ralph Ahlenstorf	Farm Krumhuk
Mr Witbooi	Director of Water Affairs

Registered Parties

Name	Organisation	Date registered
Udo Stritter	Japonica Investments Nineteen (Pty) Ltd and Namibia Estate Enterprises (Pty) Ltd	27-Apr-15
Stephanie van Zyl	EnviroDynamics	10-Jul-15
Brand van Zyl	Urban Green cc	06-May-15
Alexander Speiser	SLR Environmental Consulting (Namibia)	06-May-15
Mr Eric R Luff	African Christian Support Mission Trust	08-May-15
Ulf-Dieter Voigts	Farm Krumhuk	02-Jun-15