



CRUSHCO TRADING CC

Aggregates Quarrying Operation at Kangongo Village, Mukwe
Constituency, Kavango East Region

An Updated Environmental Management Plan for the Renewal
of an Environmental Clearance Certificate

APP- 003324



PROJECT NAME

An **Updated and Amended Environmental Management Plan** for an Aggregate Quarrying Operation at Kangongo Village, Mukwe Constituency, Kavango East Region

For the renewal of an **Environmental Clearance Certificate**

REPORT STATUS

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EXECUTIVE SUMMARY

This is an application for the renewal of an Environmental Clearance Certificate (ECC) granted to Crushco Trading CC (Crushco) for its hard rock quarry (HRQ) business venture on 25 March 2019. The HRQ is located at the village of Kangongo, in the Mukwe Electoral Constituency, about 160 km NE of Rundu in the KER.

The HRQ has been a major supplier of high quality aggregates for over forty years. The quarried aggregates are used extensively in road construction and building environments, serving end-users located in urban, peri-urban and rural areas within the KER, KWR and Zambezi region. On a monthly basis, significant volume of aggregate is also exported into Botswana via the Mohembo Boarder Post.

Crushco has integrated the aggregate production with a downstream value addition operation situated in Rundu, where cement based building construction materials (bricks, paving, interlocks, etc.) are manufactured. Such products are used in the construction of residential, commercial, institutional and industrial properties throughout the aforesaid regions. Furthermore, Crushco is also a major employer in the KER with its employees remunerated well above pay scales in the construction industry.

Since acquiring the HRQ in 2015, Crushco has endeavoured to realign its aggregate enterprise with applicable statutory requirements: laws, policies and regulations. In this connection, permits, licenses, ECC, etc. were obtained.

Based on a recent resource modelling, extractable quartzite rock reserve has been estimated at 1.3 million tons, which, at the current extraction rate of 40 000 tons per annum, gives the HRQ a lifespan in excess of 30 years. However, the inferred resource is big, and could sustain the quarrying operation for many years into the future.

Two appendixes have been attached to this report and are briefly described as follows:

APPENDIX A

An environmental report for the period March 2019 to March 2022 – the period covered by the ECC has been prepared in order to support the renewal application.

APPENDIX B

During the 2019-2020 rainy season over 1000 mm of rainfall was received in the area, which flooded the quarry pit. A dewatering permit was then requested from MAWLR in order to pump the water to the river which is 800 m away but the request was declined. MAWLR advised Crushco to pump the water into a purpose built Evaporation Pond which requires an EIA. Appendix B, therefore, consists of two parts. **Part 1** is the EIA scoping report while **Part 2** covers the EMP.

The EMP has therefore been amended and updated to reflect the above the construction and operation an Evaporation Pond. Furthermore, the EMP has highlighted the need for management measures with respect to developing an Environmental Awareness Plan and an Emergency Preparedness and Response Plan for the operation.

The HRQ has a vital and beneficial role to play in the economic setups of the aforesaid three regions and should be supported. Minimal disturbance to the environment should be expected, but with the recommendations proposed in the updated and amended EMP, and the fact that CRUSHCO is committed to implementing such measures, aggregate quarrying at Kangongo can be carried out, in a manner which is socially acceptable, commercially profitable and environmentally sustainable.

TABLE OF CONTENT

EXECUTIVE SUMMARY	iii
TABLE OF CONTENT	iv
TABLE OF FIGURES	v
TABLES	v
ABBREVIATIONS AND ACRONYMS	vi
DEFINITIONS	vii
1. PROJECT BACKGROUND	1
1.1. Introduction	1
1.2. Quarry Background	1
1.3. Renewal Notice	1
1.4. The EMP Objectives	1
2. THIS REPORT	2
3. REGULATORY FRAMEWORK	5
4. ACTIVITY DESCRIPTION	6
4.1. Operational Overview	6
4.1.1. Quarry Products	6
4.1.2. Value Addition	6
4.1.3. Employment	6
4.1.4. Aggregate Reserve	6
4.2. Production Process	6
4.2.1. Overburden Stripping	7
4.2.2. Drilling and Blasting	7
4.2.3. Loading and Hauling	7
4.2.4. Crushing and Screening	7
4.3. Existing Infrastructure and Services	8
4.3.1. Water	8
4.3.2. Electricity	8
4.3.3. Wastewater and Sewage	8
4.3.4. Roads	8
5. ENVIRONMENTAL COMPLIANCE INSPECTION	9
5.1. Methodology	9
5.2. Compliance Rating Criteria	9
5.3. Compliance Inspection Findings	10
6. MONITORING	18
6.1. Monitoring Performances	18
6.2. Environmental Code of Conduct	21
7. CONCLUSION AND RECOMMENDATION	22
7.1. Conclusion	22
7.2. Recommendation	23

TABLE OF FIGURES

Figure 1: Quarry Location.....	3
Figure 2: Village Location	3
Figure 3: Distance to Rundu.....	3
Figure 4: Aggregate Markets.....	3
Figure 5: Safety Information at Entrance.....	3
Figure 6: Copy of ECC Granted.....	4
Figure 7: Compliance Findings.....	10

TABLES

Table 1: Applicable Regulations and Policies.....	5
Table 2: Compliance Rating Criteria.....	9
Table 3: Compliance Inspection Findings.....	10
Table 4: EMP Compliance Findings.....	11
Table 5: Monitoring of Quarrying Activities.....	19
Table 6: Environmental Code of Conduct.....	21

ABBREVIATIONS AND ACRONYMS

TERM	EXPANSION
BAT	Best Available Technology
COVID-19	'CO' - Corona, 'VI'- Virus & 'D' - Disease of 2019
EC	Environmental Commissioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ha	hectare (1 ha = 10 000 m ²)
HRQ	Hard Rock Quarry
HTA	Hambakushu Traditional Authority
IAPs	Interested and Affected Parties
KER	Kavango East Region
KWR	Kavango West Region
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MHSS	Ministry of Health and Social Services
MME	Ministry of Mines and Energy
NHC	National Heritage Council
NSI	Namibia Standards Institute
PPE	Personal Protective Equipment
SHE	Safety, Health & Environment
SME	Small and Medium Enterprises
TDS	Total Dissolved Solids
TIPEEG	Targeted Intervention Programme for Economic and Employment Growth
List of Road Numbers	
B8	The route number of the road starting from B1 at Otavi to Katima Mulilo via the towns of Grootfontein, Rundu and Divundu. Today, B8 is known as the Trans-Caprivi Corridor – a vital road providing access to land-locked countries of Zambia, Botswana and DRC to the sea route via the port of Walvis Bay. The quarry is 4 km south of B8.
C48/D3403	The route number for the road starting from B8 at Divundu to Mohembo Border Post – the border post between Namibia and Botswana

DEFINITIONS

TERM	EXPANSION
Environmental Compliance Inspection	A systematic verification process of objectively obtaining and evaluating evidence to determine whether specified environmental activities, conditions, management systems and or information about these matters conform with the criteria and communicating results of the such process to the client.
Cumulative Impacts	In the context of quarrying, cumulative impacts would mean the impacts of quarrying activities which in themselves may not significant but may become significant when added to the existing and potential impacts resulting from similar or diverse activities or underrating in the area.
Environmental Component/Aspect	An attribute or constituent of the environment (i.e., air quality; marine water; waste management; geology, seismicity, soil, and groundwater; marine ecology; terrestrial ecology, noise, traffic, socio-economic) that may be impacted by the proposed project.
Environmental Impact	A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.
Environmental Management Plan (EMP)	A working document which contains site project specific plan developed to ensure that environmental management practices to eliminate and control environmental impacts are followed during the developmental phases of that site, project and or facility and would normally consist of construction phase, operational phase and decommissioning phases. Commissioning and Operation phases.
Environmental Monitoring	The collection, evaluation and summarization of environmental data by continuous or periodic monitoring of certain qualitative and quantitate indicators characterizing the state of environmental components and their modification as a result of the impact of natural and anthropogenic factors.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have detrimental impact on health and the environment.
Interested and Affected Parties	All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project, including neighbouring landowners & Road Fund Administration.
Non-compliance	Issues that are in direct non-compliance with the requirements, commitments and/or management measures as approved in the EMP.
Overburden	In the context of this quarrying operation, overburden is the soil layer that lies above the dolomitic rock which is extracted for the production of aggregates. The first 400mm layer of the overburden comprises of topsoil which supports the rooting system for vegetation, plants and trees and should be set aside and preserved for future rehabilitation.
Sensitive Area	A sensitive area or environment is described as an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is high potential for ecotourism
Vegetation Rehabilitation	This refers to the re-establishment of indigenous vegetation with a similar species composition to that which naturally occurs in the specific geographical environment.
Waste	Any substance, whether or not that substance can be reduced, re-used or recycled and recovered- <ul style="list-style-type: none"> • that is surplus, unwanted, rejected, discarded, abandoned or disposed of; • which the generator has no further use of and for the purposes of production; • that should be treated or disposed of; • that is identified as waste by the Minister by notice in the Gazette and includes waste generated by the quarrying, mining, medical or other sector, and • any portion of waste, once reused, recycled and recovered, ceases to be waste.
Waste Management	Classifying, recycling, treatment and disposal of waste generated during construction, operation and decommissioning activities.

1. PROJECT BACKGROUND

1.1. INTRODUCTION

This is an updated and amended Environmental Management Plan (EMP) prepared to support an application for the renewal of an Environmental Clearance Certificate (ECC). The ECC was granted to Crushco Trading CC (Crushco) for its hard rock quarry (HRQ) business operation, on 25 March 2019, following an Environmental Impact Assessment (EIA) study and a comprehensive public participation process conducted by Ekwao Consulting (Ekwao) during the second half of 2018.

In terms of the Environmental Management Act (EMA) and applicable Regulations, the production of aggregates is a listed activity which may not be undertaken without an ECC having been granted by the Environmental Commissioner (EC) of the Ministry of Environment, Forestry and Tourism (MEFT). The aforesaid ECC was valid for three years and is being renewed at its anniversary for Crushco to remain compliant with the provisions of EMA.

1.2. QUARRY BACKGROUND

The hard rock quarry is situated at Kangongo, a small village in the Mukwe Constituency, Kavango East Region (KER) (**Fig.1**). The village is to the northeast of Rundu about 160 km away. The Kangongo based quarry has been a major supplier of high quality aggregates for many years, supplying end-users in the three regions of Zambezi and Kavango East and West.

Quarrying has been performed from the same resource since the mid-eighties and over that period the hard rock quarry has changed hands at least four times. It was acquired by the current owner, Crushco, in November 2015.

The aggregate quarried is a dolomitic quartzite rock which is found, sporadically exposed at shallow depths along the banks of the Kavango River. The dolomite aggregate is of high quality meeting all civil and engineering construction standards and specifications.

The quarry is on land measuring about 60 ha – a communal land which falls under the jurisdiction of the Hambakushu Traditional Authority (HTA). The current quarry footprint is about 9 ha. The Kavango River is to the north about 800 m from the quarry.

1.3. RENEWAL NOTICE

In November 2021, a notice for the ECC renewal was submitted to MEFT, which allocated the application this reference number: **APP - 003324**.

Given the economic recession which confronted the local construction sector following the end of the Targeted Intervention Programme for Economic and Employment Growth (TIPEEG), combined with the effects of the Covid-19 pandemic on economic activities, there were no significant changes made on the quarry infrastructure or its operational protocols over the last three years.

1.4. THE EMP OBJECTIVES

As a developing country, the overall objectives for the EMP are to ensure that economic activities are conducted in a manner that protects and safeguards the environment for the wellbeing of all inhabitants of the land. In this regard Crushco, which operates an aggregate quarry is expected, amongst others:

- To comply with national legislation and standards for the protection of the environment.
- To strive to limit potential impacts on the biodiversity by eliminating or limiting its quarrying footprint and the conservation of residual habitat within the quarry premises.
- To protect soil and groundwater resources through the implementation of measures for spill prevention and effective cleaning up in the event that a spill does indeed occur.
- To conserve soil resources by stripping, stockpiling and managing topsoil for rehabilitation of the quarry pits including developing a realistic and workable final closure plan for the quarry.

- To support and encourage environmental awareness and responsibility amongst all employees and service providers to the company.
- To develop, implement and manage monitoring systems to ensure good environmental performance in respect of surface and ground water, air quality, noise and vibration, biodiversity and rehabilitation.
- To avoid potential impacts on the safety of the surrounding communities by ensuring that members of the communities do not reside dangerously close to the quarry and its related activities.
- To maintain an open and transparent communication relationship with the surrounding communities by informing such community members of quarrying activities including blasting schedules and any vacancies that occur from time to time.

2. THIS REPORT

This report contains the EMP that has been used by Crushco management and its personnel from March 2019 when the ECC was granted. The said ECC is attached in **Fig. 6**. The EMP has been reviewed and updated to reflect the most current operational protocols in the past three years without repeating the findings of the EIA conducted during the second half of 2018.

This report consists of two sections attached as Appendix A and Appendix B.

Appendix A:

A consolidated environmental report covering the period March 2019 to March 2022 the tenancy of the ECC granted and includes an environmental compliance report.

Appendix B:

Appendix B consists of the EIA report requested by MWALR for the construction and operation of an evaporation pond for the dewatering of the quarry pit. Therefore, Appendix B consists of two parts – **Part 1 of 2** is the Environmental Assessment Scoping report while **Part 2 of 2** comprises of the EMP report. The letter from MWALR is attached under **Part 1 of 2** as **Annexure 1**.

The construction of the evaporation ponds is subject to the approval and granting of the ECC.



Figure 1: Quarry Location



Figure 2: Village Location

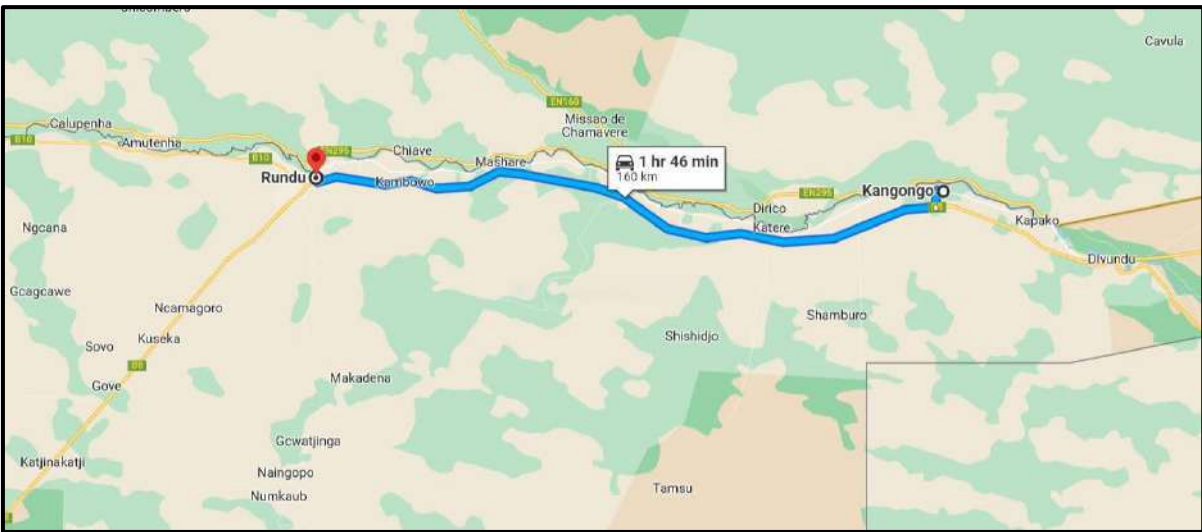


Figure 3: Distance to Rundu

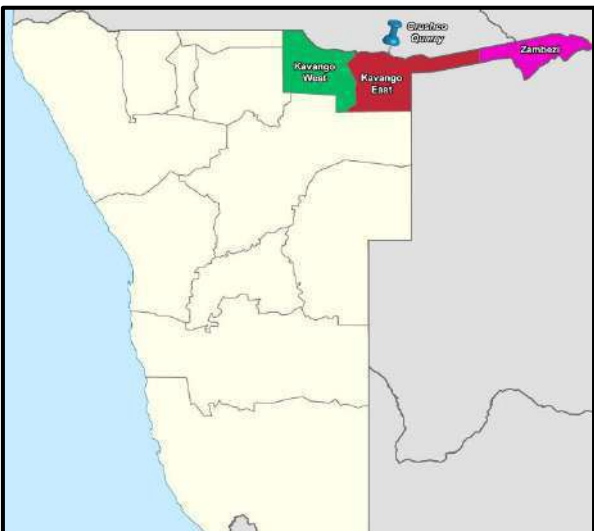


Figure 4: Aggregate Markets



Figure 5: Safety Information at Entrance



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22 March 2019

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

The Manager
Crushco Trading CC
P O Box 302
Rundu

Dear Sir/Madam:

SUBJECT: ENVIRONMENTAL CLEARANCE CERTIFICATE FOR THE EXISTING QUARRYING OF AGGREGATE AND DISTRIBUTION AT KANGONGO VILLAGE, MUKWE CONSTITUENCY, KAVANGO EAST REGION

The Environmental Impact Assessment and Environmental Management Plan submitted are sufficient as these have made an adequate provision of the environmental management for the proposed activities. From this perspective, regular environmental monitoring and evaluations on environmental performance should be conducted. Targets for improvements should be established and monitored throughout this process.

This Ministry reserves the right to attach further legislative and regulatory conditions during the operational phase of the project. From this perspective, I issue this clearance with the following condition: All relevant permits are obtained prior to the commencement of the proposed activities.

On the basis of the above, this letter serves as an environmental clearance certificate for the project to commence. However, this clearance letter does not in any way hold the Ministry of Environment and Tourism accountable for misleading information, nor any adverse effects that may arise from this project's activities. Instead, full accountability rests with Crushco Trading CC and their consultants.

This environmental clearance is valid for a period of (three) 3 years, from the date of issue unless withdrawn by this office.

Yours sincerely,

Fredrick Mupoti Sikabongo
DEPUTY ENVIRONMENTAL COMMISSIONER



"Stop the poaching of our rhinos"

All official correspondence must be addressed to the Permanent Secretary

Figure 6: Copy of ECC Granted

3. REGULATORY FRAMEWORK

The following legislations, policies and regulations are applicable to this operation and Crushco, as the promotor, is expected to observe, and where applicable, to comply with such laws, regulations and policies.

TABLE 1: APPLICABLE REGULATIONS AND POLICIES

Aspects	Applicable Legislation
Quarrying requires an Environmental Clearance Certificate (ECC)	Environmental Management Act, Act No. 7 of 2007
Extraction of industrial minerals <i>(NB: at present aggregate is not classified as a mineral resource in Namibia, but this could change which will result in the requirement of a Mining Claim or Mining Licence)</i>	Minerals (Prospecting and Mining) Act, Act 33 of 1992 Environmental Management Act
Generation of electricity including renewable energy whether using wind or sun.	The Electricity Act, Act 4 of 2007
Erection of accessory works (workshops, fixed crushing and screening plants, etc.)	Minerals (Prospecting and Mining) Act, Act No. 33 of 1992, Section 90 (1) (e) and 2(a)
Requirements or permission to possess, transport, store and to use explosives.	The Explosive Act, Act No. 26 of 1956, Section 6(1)
Permission to conduct blasting activities using explosives	Explosive Act, Act No. of 1956, Section 9 (1)
Regulations related to labour, conditions of employment, hiring, termination, conditions, etc.	The Namibian Labour Act, Act No. 6 of 1992, as amended
Wastewater effluent disposal	Water Act, 1956 No. 54 of 1956, Section 21 and 22 Water Resource Management Act, No. 11 of 2013 Section 13
Aspects related to water abstraction, water use including permission to drill for boreholes	Water Resources Management Act, Act No. 11 of 2013
Air pollution and control	Atmospheric Pollution Prevention Ordinance No. 11 of 1976
Waste handling and management (solid, industrial and hazardous)	Waste Management Regulations: Local Authorities Act of 1992 Solid Waste Management Strategies Hazardous Substance Ordinance No. 14 of 1974
Installation of fuel consumer facilities	Petroleum Products and Energy Act, Act No. 13 of 1990
Reporting of major fuel spills and leakages	Petroleum Products and Energy Act, Petroleum Products Regulations of 2000, Reg. 49(1)
Licensing to operate vehicles on public roads Driving vehicles on public roads Fitness of vehicles to be operated on public roads Road safety Road speed limits on public roads Installation of traffic signs Driving while under the influence of liquor Overloading and related fines for offenders	Road Traffic and Transport Act, Act No 22 of 1999
Log books for mass distance charges Overloading Abnormal permits, etc.	Road Fund Administration Act, Act No. 18 of 1999
Measures related to Covid-19 Pandemic <ul style="list-style-type: none"> • Lock downs • Testing and quarantining • Wearing of face masks • Sanitation • Vaccines 	Public and Environmental Health Act No. 86 of 2015

4. ACTIVITY DESCRIPTION

4.1. OPERATIONAL OVERVIEW

4.1.1. Quarry Products

Listed below are the core products from the hard rock quarry that are used in a wide range of construction applications: ready mix, road surfacing, precast, asphalt, civil works, bricks, blocks and paving bricks:

- 22 mm stones
- 19 mm stones
- 13.5 mm stones
- 9.5 mm stones
- 6.75 mm stones
- 4.75 mm crusher dust

4.1.2. Value Addition

Crushco has integrated the aggregate production with a downstream value addition operation located in the town of Rundu, where cement based building construction materials are manufactured. A range of building construction materials is manufactured at the facility, amongst others, standard bricks, super bricks, hollow blocks, paving bricks and interlocks. These products are used in the building of houses, roads, bridges, schools, hospitals, commercial buildings and other vital infrastructures

Operating from its base in the town of Rundu, Crushco is a major role-player in the production and distribution of aggregates. On a daily basis trucks are loaded at the quarry delivering aggregates to end-users located all over the three regions of Zambezi and Kavango West and East. On a monthly basis, significant volume of aggregate is also exported into neighbouring, Botswana via the Mohebo border post.

4.1.3. Employment

Crushco is a significant employer with a total workforce of sixty (60) employees on its payroll, with eighteen (18) personnel employed at the quarry and forty two (42) working at its brickyard in Rundu. In fact, Crushco gives rise to a significant 'multiplier effect' when consideration is given to the number of building projects using bricks and aggregates that are constructed in the said three regions, both by the private and public sectors.

4.1.4. Aggregate Reserve

Based on resource modelling done by a consultant geologist, extractable quartzite rock reserve of 1.3 million tons has been measured confined to about 35 ha. At the projected average extraction rate of 40 000 tons per year, measured rock reserve will give the quarry a lifespan of at least 33 years. The inferred resource (i.e. the rock resource which has been estimated using empirical methods) is however big, and could sustain the quarrying operation for many years into the future.

4.2. PRODUCTION PROCESS

The activities involved in aggregate production as conducted by Crushco are briefly described below, each step having its own set of environmental impacts and challenges:

- overburden stripping
- drilling and blasting
- loading and hauling out of the quarry pit

- crushing – several stages
- screening, and
- distribution

4.2.1. Overburden Stripping

This activity is only undertaken when virgin land has to be prepared and, is more often associated with vegetation clearing and removal (stripping) of topsoil in order to expose the surface of the dolomitic quartzite rock underneath. Depending of the area stripped, once an area has been stripped, quarrying in that specific area will continue for a number of months, if not years, before a new area has to be prepared.

It is important that overburden stripping is preceded by careful planning, surveying and demarcation of areas targeted for such activities. (*Potential impacts: vegetation clearing, soil erosion, land disturbance, etc.*).

No virgin land was prepared for quarrying during the period covered by the ECC.

4.2.2. Drilling and Blasting

Drilling and blasting are activities associated with hard rock quarrying. Normally, the area identified for drilling and blasting is demarcated, holes drilled, charged with explosive and detonated. The volume of aggregates generated is determined by the extent of the demarcated area, the depth of the drill blast holes, the type of explosives utilised and the efficient use of blast energy in the rock breaking process. The ultimate purpose of blasting is to break down the massive hard rock, into small pieces that can be handled safely in the subsequent sizing reduction processes.

Blasts are designed to avoid adverse impacts on the quarry infrastructure and on the surrounding receivers. For each individual blast, appropriate maximum instantaneous charge (MIC) is calculated taking into account tonnage requirements, environmental conditions and predicted air blast overpressures.

Ideally, a successful blast is aimed at achieving a high degree of rock fragmentation with less throw of rock materials, less blast vibration and a greater level of safety and stability to nearby structures and for all the people working around the quarry. (*Potential negative impacts: – noise, dust, vibration, flying rocks, quarry slope instability, etc.*)

On average two blasts were carried out per year over the period covered by the report. The reason being subdued activities in the construction sector. During peak construction activities four blasts are conducted per year.

4.2.3. Loading and Hauling

The blasted rock is loaded into dump trucks using a hydraulic excavator and hauled out of the quarry pit to a fixed crushing and screening plants located outside the quarry pit. Crushco uses off-road dump trucks with payloads of 30 tons to haul the blasted rock from the quarry pit to crushing plant. (*Potential impacts: dust during loading and dumping, noise, slippery when roads are wet, etc.*)

Given the limited construction activities, one dump truck was able to meet the crushing requirements over the last three years.

4.2.4. Crushing and Screening

From the quarry pit, the rock is stockpiled above a surge grizzle feeder which feeds the primary crushing plant at a predetermined rate. The crushing plant has a nameplate capacity of 5 000 tons per month working on a single shift of 8 hours per day.

Conveyor belts are used to transport crushed rock to the screens and screened rock to the various product stockpiles. Both crushing and screening are dry processes without the use of water. The products are stored on stockpiles on site ready for delivery to clients. (*Possible environmental impacts are: dust, noise, etc.*)

4.3. EXISTING INFRASTRUCTURE AND SERVICES

The following infrastructure and services are available:

4.3.1. Water

Water for human use is sourced from the river which is about 800 m from the quarry. There is no pipeline installed but a water bowser (6000 liters) is used to cart water to the HRQ. The company was granted a water extraction permit for this purposes by the line ministry which has a maximum limit of 288 m³ per year. The permit is attached to this report under **Appendix B, Part 1 of 2, Annexure 1**.

4.3.2. Electricity

Electricity is available at the site, sourced from Nored Electricity facilitated via a 3-phase transformer.

4.3.3. Wastewater and Sewage

An onsite sewerage system has been constructed to serve the quarry personnel.

4.3.4. Roads

The quarry is along the old gravel road which linked the town of Rundu and Divundu and about 4 km from B8 tar road.

5. ENVIRONMENTAL COMPLIANCE INSPECTION

An environmental compliance inspection was carried out on 21 April 2022 and this report is compiled in support of the renewal application. The compliance assessment has indicated and compared the current status of the aggregate quarry against the approved baseline information as contained in EA scoping report conducted during the second half of 2018. The objectives of the compliance assessment were, inter alia, the following:

- To assess the compliance of Crushco with respect to regulatory stipulations applicable to its operational sphere, i.e. the quarrying operation.
- To provide any verifiable findings in a structured and systematic manner.
- To ascertain the level and degree of compliance of Crushco with respect to management measures as recommended in the EMP for standard and specific conditions.
- To identify, if any predicted impacts of the project had occurred as well as any unforeseen deviations that may merit the implementation of corrective measures.

5.1. METHODOLOGY

The methodology used was based on visual confirmation assessment, interview with Crushco management, site personnel, facility inspection and discussions with relevant stakeholders in order to gain insight into key operational processes and the alignment of such processes with the actual compliance requirements as outlined in the EMP.

Observations and findings were made during the said visit which was conducted specifically for the purpose of assessing the compliance against the provisions of the EMP and the ECC granted to Crushco three years earlier.

5.2. COMPLIANCE RATING CRITERIA

The rating criteria used are described in Table 2 below:

TABLE 2: COMPLIANCE RATING CRITERIA

Rating Criteria	
Non-Compliant (NC)	The company is not in compliance with the conditions in the EMP, or the implementation has been partially fulfilled at this stage.
Full Compliant (FC)	The requirements as stipulated in the EMP have been complied with based on site inspections, discussions with staff personnel, general workers and or documentary evidence produced.
Not Applicable (NA)	A requirement of the EMP, or other environmental legislation is not applicable or it was not assessed because no activities took place or it is no longer applicable to the specific site.
For Noting (NO)	A requirement as prescribed in the EMP has been noted but does not require the compliance at this stage.

5.3. COMPLIANCE INSPECTION FINDINGS

The EMP for the aggregate quarry had a number of compliance requirements/conditions. The findings of the compliance assessment as carried out is summarized as follow:

- A total of 91 conditions or requirements were assessed for compliance.
- Out of the 91 conditions, Crushco was found non-compliant on 3 conditions were found non applicable.
- Out of the 91 conditions, 28 conditions were recorded for noting purposes only and therefore not assessable.
- Out of the 91 conditions, 60 conditions were recorded as assessable conditions.

Out of the 60 assessable conditions, the compliance findings achieved were as follow:

- Crushco was found fully compliant on 50 conditions, which equates to 83.34%.
- Crushco was found partially compliant on 8, which equates to 13.33%.
- Crushco was found non-compliant on 2 conditions, which equates to 3.33%.

TABLE 3: COMPLIANCE INSPECTION FINDINGS

Compliance Inspection Findings		
Rating	Condition	Percentage
Full Compliance (FC)	50	83.36%
Partial Compliance (PC)	8	13.33%
Non-Compliance (NC)	2	3.33%
Not Applicable (NA)	3	
For Noting (FN)	28	
Total	91	

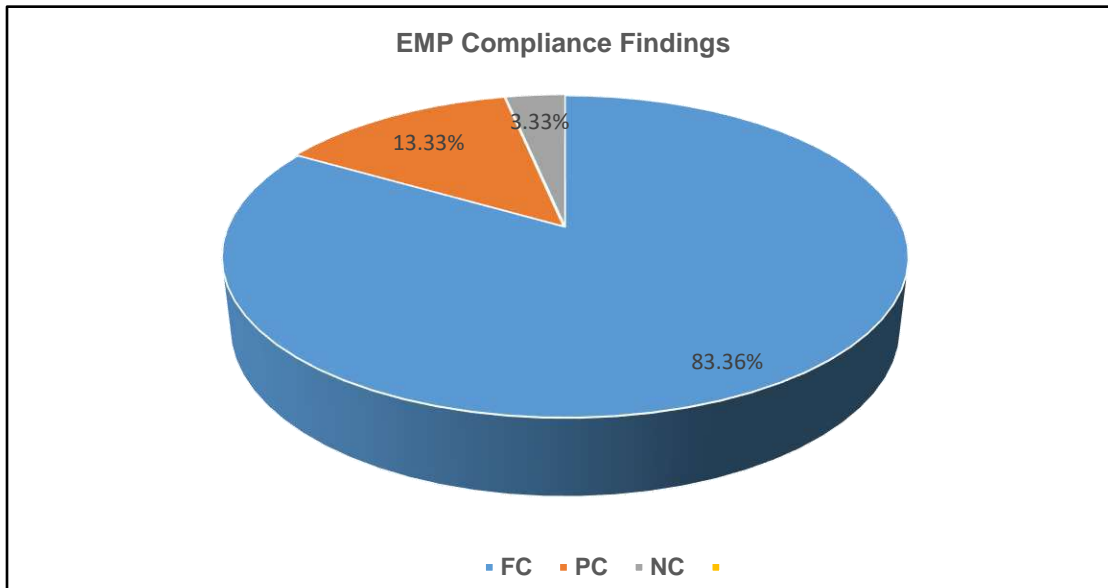


Figure 7: Compliance Findings

TABLE 4: EMP COMPLIANCE FINDINGS

A. STANDARD AND GENERAL CONDITIONS

EMP Conditions	Compliance Status	Remarks/Comments
Full Compliance (FC), Partial Compliance (PC), Non-Compliance (NC), Not Applicable (NA) & For Noting (FN)		
1. STANDARD CONDITIONS/GUIDELINES		
1.1 No quarrying maybe conducted without an ECC having been granted.	FC	The EIA was done and an ECC granted which is being renewed.
1.2 The conditions of the EMP are binding on the proponent.	FN	The requirement has been noted.
1.3 All current and future employees must be acquainted with the provisions of the EMP.	FC	Compliance has been achieved.
1.4 Any material changes to or deviations from the scale and scope of quarrying operation must be approved by the EC. The impacts of such changes must be evaluated and assessed.	FN	Dewatering of quarry pits has become a challenge and is being addressed in this updated EMP.
1.5 Where any of the applicant's contact details change including the name of the responsible person, the EC must be notified of such changes.	FN	No change has taken place since the ECC was granted.
1.6 A copy of the EMP and the ECC must be kept at the quarry site. Both documents should be provided to any GRN official(s) upon request.	FN	Management has noted the requirement.
1.7 Any contractor hired to work on the quarry must be provided with a copy of the EMP. The proponent must ensure that the EMP has been understood.	FN	Management has taken note of the requirement.
1.8 The ECC does not negate the proponent to comply with any other statutory requirements which may be applicable to the activity being undertaken.	FN	Management has noted the requirement.
1.9 Unless indicated otherwise or withdrawn an ECC is normally valid for a period of three years.	FC	Management has taken note of the remark.
2. GUIDELINES RELATING TO STAFFING & PERSONNEL		
2.1 Appointment of a Quarry Manager (QM)	FC	The quarry is managed by an experienced and competent QM.
2.2 Appointment of SHE Officer	NA	Work is being done by QM. Scope of the operation does not justify a fulltime SHE Officer.
2.3 Conduct any new recruitment in a fair and transparent manner by considering women and persons with disabilities who have suitable skills and experience.	NA	Quarry has been operating at minimal scale due to subdued activities in the local construction sector – hence no new vacancies were available.
2.4 All employees must have formal employment contracts duly signed by both parties	FC	Records are on file.
2.5 Proper records must be kept with respect to the number of people employed, their full names, IDs, residential addresses.	FC	Records are on file.
2.6 Employees to be registered with all statutory institutions such as Social Security, Inland Revenue, etc.	FC	Records are on file.
2.7 Employees should be allowed to belong to a trade union of their choice. An employee charged with a misconduct should be allowed to have a representative.	FN	Management has noted the recommendation.
2.8 Provide and supply PPE to all employees working on the quarry and enforce wearing of such PPE.	FC	Suitable PPE is provided to employees.

B. EMP SPECIFIC GUIDELINES

Aspects	Environmental Objectives	Management Measures	Compliance Status	Remarks
FC = Full Compliance, PC = Partial Compliance, NC = Non-Compliance, NA = Not Applicable & FN = For Noting				
Health, Safety and Security	Maintain a high standard of safety and security for the aggregate quarry.	1. Boundary Fence: Install a high security fence around the quarry premises with a manned access point to prevent access by pedestrians, vehicles and animals.	FC	The quarry premises has been fenced in with a manned security gate access.
		2. Safety Induction: Any person entering the quarry premises must get a quick induction on safety practices in operation at the quarry.	FC	No evidence of non-compliance was noted.
		3. Signage: Appropriate signs must be placed to caution employees and any third parties not to enter certain areas such as blasting areas without permission.	FN	Management has taken note of the recommendation.
		4. Hazardous Areas: Potentially hazardous areas within the quarry premises that are not immediately repaired or rectified must be demarcated and cordoned off with danger tapes.	FN	The requirement has been noted by management.
		5. Emergency Response Plan: Develop an emergency response plan for the aggregate quarry to deal with major emergencies such as accidents, fires, slope collapse, etc.	PC	No formal written Emergency Preparedness Plan is available but employees have a mental procedure of what to do in case of an emergency.
		6. First Aid Kit: Provide a first aid kit for the quarry operation and ensure that it is fully stocked and employees trained on how to use the kit in case of an accident or emergency.	FC	No evidence of non-compliance was noted.
		7. PPE: Quarry employees should be provided with safety shoes and overalls. Employees working in areas where noise/dust levels are high must be provided with suitable PPE and wearing thereof enforced.	FC	Employees are supplied with suitable PPE.
		8. Housekeeping: Maintain a high standard of housekeeping practices at the workplace which promotes a clean environment and zero tolerance for alcohol abuse. No guns and no drugs are permitted on the company premises. Encourage good handling and disposal of waste.	FC	No evidence of non-compliance was noted.
		9. Communication: A complainant book should be kept at the security access gate where any stakeholder who has a complaint to make (or can suggestion) can write such complaint.	NC	Management will implement the recommendation.
		10. Feedback: Feedback to any complaint made should be provided through the Kangongo Community Office.	NC	Management will implement the suggestion.
Management of Land and Soil Disturbances	Ensure limited land disturbances is made and the aesthetic values is maintained. Develop a topsoil (overburden) management plan which incorporates the rehabilitation of the quarry	11. Vegetation: Avoid unnecessary vegetation clearing and confine quarrying to clearly planned and demarcated areas where dolomitic quartzite rock occurs.	FC	No evidence of non-compliance was observed.
		12. Aesthetic & Erosion: Areas temporarily disturbed during the construction of any access roads that are not required for quarry operations should be identified, graded and rehabilitated to improve aesthetics and reduce erosion.	PC	No new access roads were observed.
		13. Rehabilitation: Rehabilitate areas disturbed by quarrying and or installation of any service work to a stable landform.	PC	No evidence of rehabilitation was observed.

Aspects	Environmental Objectives	Management Measures	Compliance Status	Remarks
FC = Full Compliance, PC = Partial Compliance, NC = Non-Compliance, NA = Not Applicable & FN = For Noting				
		14. Monitoring: Monitor all mined out areas and any erosion prone sites at the end of the rainy period visually, and effect any repairs required.	FC	Areas prone to soil erosion have been identified and are being monitored during and after the rainy season.
Management of Biodiversity	Ensure that the integrity of the ecosystem is maintained by preventing and limiting unacceptable loss of biodiversity and related functionality	15. Habitat: Preserve areas within the quarry premises which provide unique habitats including any trees where birds are nestling.	NA	No such habitats existed within the quarry premises.
		16. Poaching: Killing or poaching of livestock grazing around the quarry is strictly prohibited.	FN	Employees are aware that poaching is a criminal activity punishable by law.
		17. Firewood: Illegal harvesting of trees for fire wood or for any other purpose is prohibited.	FN	Firewood is available outside the quarry premises, otherwise employees are aware of illegal logging of timber.
		18. Internal Routes: Limit movements of earthmoving machinery and LDVs on internal quarry routes that are well maintained and kept free of spillages.	FC	No movements outside designated areas were observed. Employees have been trained on the EMP.
		19. Waste water: Ensure that livestock in the area does not gain access to the waste water from the quarry pits.	FC	A silt pond previously used for dewatering has been fenced in and no longer pose a risky to the community members and their livestock.
Management of Traffic, Access and Internal Quarry Routes	Enhance and protect amenity values by ensuring that traffic regulations are upheld and internal routes are well maintained	20. Access Roads: Ensure that access road to the quarry and all internal routes within the quarry premises are well maintained, kept dust and spill-free.	FC	No evidence on non-compliance was observed.
		21. Road Regulations: All vehicles operated on public roads (company owned or third parties collecting aggregates) should be roadworthy, licensed and operated by licensed drivers. Road regulations should be complied with.	FC	No evidence of non-compliance was noted.
		22. Designated Routes: Movements of all earthmoving machinery, plants and vehicles on the quarry must be controlled to use designated routes.	FC	No tracks were observed outside the designated quarry routes.
		23. Overloading: No overloading is allowed and all trucks loading aggregates using the B8 public tar road should pass over the quarry weighbridge to have their payloads weighted and recorded.	FC	A weighbridge is available and all trucks are weighed and records kept at the quarry.
		24. Intoxication: Driving under the influence of alcohol is strictly forbidden. Drivers found drunk should be disciplined or dismissed.	FN	Management is aware of the recommendation.
Noise Management	Noise: Enhance and protect amenity values by ensuring that noise is minimised.	25. Working Hours: If ever feasible, confine quarrying activities to day-time hours (7AM to 5PM - Monday to Friday and 7AM to 1 PM on Saturday with no work on Sundays & public holidays	FN	The recommendation has been noted by management.
		26. Implement Good Practice Measures: <ul style="list-style-type: none"> • Ensure machineries are well maintained and any defective silencers replaced. • Switch off machinery when not in use. 	FC	No evidence of non-compliance was observed during the compliance inspection visit.

Aspects	Environmental Objectives	Management Measures	Compliance Status	Remarks
FC = Full Compliance, PC = Partial Compliance, NC = Non-Compliance, NA = Not Applicable & FN = For Noting				
		<ul style="list-style-type: none"> No sound amplifications is allowed. Avoid long idling and unnecessary hooting. Maintain haul routes regularly to avoid corrugations and potholes. Declines into the quarry should not be too steep. Provide suitable PPE to workers. 		
Management of Blasting and Associated Vibrations	Protect amenity values by ensuring that air blast and vibrations are limited	27. Permit: A permit is required from the Ministry of Safety & Security to use, handle, transport and to store explosives and associated goods (i.e. electrical detonators, fuses, etc.).	FC	Blasting is conducted by a third party who also handles the procurement, handling, transport and storage of required explosives and detonators.
		28. Blast Scale: Match scale of blast to plant capacity and avoid blasting huge rock masses which result in excessive air blasts and vibrations.	FN	Management has taken note of the recommendation.
		29. Blast Design: Ensure that charging up, blasting pattern and firing is well sequenced allowing less throw of blasted rock.	FN	Management has taken note of the recommendation.
		30. Blast Notification: Clear blast notifications should be posted at the quarry entrance and communicated to community members.	FC	No evidence of non-compliance was observed.
		31. Records: Keep proper records of each blast conducted. Any complaint received from any stakeholder must be recorded investigated and corrective action taken.	FC	Records are being kept at the quarry office.
		32. EMP: Ensure that the third party conducting blasting is licensed and well acquainted with the EMP.	FC	The requirement is being complied with.
		33. Complains: Any complaint received from any stakeholder with respect to blasting should be recorded, investigated and corrective action taken.	FC	No complain has been received regarding blasting activities.
Management of Impacts on Air Quality	Ensure that dust and other gaseous emissions do not pollute the air quality and that social and health values are maintained.	34. Dust Suppression: Use appropriate dust suppression measures during high dust conditions such as dampening with water or other suppression measures.	FC	No evidence of non-compliance was observed.
		35. Blasting Fumes: In the event that fumes occur after blast then the immediate vicinity of the blast area must be kept clear until such fumes have dissipated. Wind direction and weather conditions should be considered to ensure that fumes do not impact further afield.	FN	The suggestion has been taken note of by management.
		36. Stockpiles: Site material stockpiles in sheltered areas where they are not exposed to erosive effects of the wind. Where erosion of stockpiles become a problem, reduce stockpile sizes or site stockpiles where they are not exposed by wind.	FN	Management has taken note of the requirement.
		37. Blasting: Avoid or minimise air quality impacts by implementing blasting management and mitigation measures, i.e. blasting during the time when the lowest wind prevails.	FN	Management has taken note of the requirement.
		38. Internal Routes: Spread a layer of crushed stones on all internal quarry routes or other suppressants in order to combat dust generation.	FC	No obvious non-compliance was noted.

Aspects	Environmental Objectives	Management Measures	Compliance Status	Remarks
FC = Full Compliance, PC = Partial Compliance, NC = Non-Compliance, NA = Not Applicable & FN = For Noting				
		39. Speed Limits: Limit speed limits on all quarry internal routes to 20 km per hour and enforce compliance.	FC	No speed limits were installed but the speed limit is known by operators.
		40. Maintenance: Machinery must be regularly serviced and well maintained to minimise NO ₂ emissions and associated impacts. Long idling should also avoided.	FC	There were no signs of non-compliance noted.
		41. PPE: Employees working in areas where dust is high should be provided with suitable PPE such as dust masks.	FC	The EMP requirement is being complied with.
		42. Complaints: Any complaint received from any stakeholder regarding air pollution must be recorded, investigated and corrective action taken.	FC	No complaint has been received from any stakeholders.
Water Management Plan: (a) Surface Water	Prevent pollution of surface water run-off	43. Water Abstraction Permit: An abstraction water permit is required from the line ministry to tap water from a natural water source such as a river. The quarry sources its water from the Kavango River.	PC	A water permit has been obtained
		44. Dewatering Permit: A dewatering permit is required from the line ministry to pump water into a natural water resource or silt ponds	PC	An application for the dewatering permit has been launched. The EMP has been updated to address dewatering challenges and possible impacts.
		45. Dirt & Clean Water: Where practically possible, develop a surface water management solution which keeps dirty water separate from clean water run-off through, perhaps construction of berms or trenches or channels	FN	Management has taken note of the requirement.
		46. Contaminated Water: Cleaning of machinery and equipment should be done in wash bays with concrete floors or with lined impermeable bunded areas. Do not discharge water used in the cleaning process into the natural environment, but to drainage oil and silt sumps that are regularly cleaned.	FC	No obvious signs of non-compliance were observed.
		47. Dewatering: Water collected into the quarry pits may be discharged into the natural water channels if the quality of such water is within acceptable limits.	FN	Various tests of the water in the quarry pits were undertaken and no contamination was found.
		48. Silting Pond: If the water collected in the quarry pits is contaminated, such water may be pumped into a settling pond and used for dust suppression or used to support an irrigation project (land is available).	FN	A silting pond will be constructed once a Mining Licence has been issued by MME under the mining accessory protocol.
		49. Hazardous Waste: Ensure that the handling of hazardous waste is effective and does not result in the contamination of surface water run-off.	FC	No evidence of non-compliance was observed.
		50. Hydrocarbon Spills: By law any fuel spill over 200 litres should be reported to MME. Any fuel spill should be cleaned up by scooping out all the fuel-soaked soil. Store in a leak-proof container and dispose of in a responsible manner.	FC	No obvious evidence of non-compliance was observed.
(b) Underground Water	Ensure that quarrying activities do not pollute the	51. Seepage: Ensure that sewage systems, oil and fuel storage facilities are leak-proof and well maintained such that seepage to the underground water resource does not occur.	FN	The Quarry Management is aware of the requirement.

Aspects	Environmental Objectives	Management Measures	Compliance Status	Remarks
FC = Full Compliance, PC = Partial Compliance, NC = Non-Compliance, NA = Not Applicable & FN = For Noting				
	groundwater resource Manage the water requirements	52. Housekeeping: Maintain a high standard of housekeeping which includes training of employees to appreciate the importance of maintaining a clean environment, to avoid polluting of natural water sources, waste handling and management.	FC	
Waste Management	Enhance and protect amenity values by ensuring a hygienic and waste-free quarry operation	53. Waste Management Plan: Develop a waste management plan for the quarry which takes into account waste types, storage and disposal thereof.	PC	No formal management plan, but employees follow a structured method.
		54. Hazardous Waste: Store hazardous waste (oil filters, used oil, etc.) in secure leak-proof containers and dispose of in a responsible manner or transport to Rundu for disposal. Under no circumstances may hazardous waste be buried on the quarry premises.	FC	No evidence of non-compliant was observed.
		55. General Waste: Keep the quarry premises tidy and clean at all time by cleaning all domestic and workshop waste daily and disposing of at designated area or waste bins.	FC	No evidence of non-compliant was observed.
		56. Waste Bins: Provide separate containers or bins for household, office and general workshop waste. Ensure that waste is disposed of in a safe and responsible manner. Small quantities of dry waste (office waste, etc.) may be disposed of by burning on site.	FC	No evidence of non-compliant was observed.
		57. Marked Waste Bins: Ensure that waste bins are clearly marked and employees trained on different types of waste and disposal thereof.	FC	No evidence of non-compliant was observed.
		58. Sewerage: Sewage or black water from septic tanks may not be discharged directly into the environment. Onsite septic tanks must be emptied on a regular basis using approved methods.	FC	No evidence of non-compliant was observed.
Fuel Storage, Refueling and Handling Management	Protect amenity, operational and business efficiency by ensuring that any adverse impacts from fuel storage and handling are minimised.	59. Storage: Provide a secure fuel storage area within the quarry premises at least 100 m from any surface or underground water source. Fuel tank must be placed on a smooth impermeable surface with an earth bund around.	FC	No evidence of non-compliant was observed.
		60. Fuel Security: Access to the fuel storage area must be restricted and tanks locked with the keys in the office at all times. No naked flames or smoking is permitted in the vicinity of the fuel storage area.	FC	No evidence of non-compliant was observed.
		61. Handling: The personnel handling fuel should be properly trained and well acquainted with fuel regulations and the provisions of the EMP.	FC	No evidence of non-compliance was observed.
		62. Fueling: Conduct refueling on a hard impermeable surface or over drip pans to ensure spilled fuel is captured and cleaned up. Defective hoses, valves and containment structures should be promptly repaired.	FC	No evidence of non-compliance was observed. Employees are aware of the procedure to follow when refueling.

Aspects	Environmental Objectives	Management Measures	Compliance Status	Remarks
FC = Full Compliance, PC = Partial Compliance, NC = Non-Compliance, NA = Not Applicable & FN = For Noting				
		63. Signage: Symbolic signage clearly depicting 'Danger', 'No Smoking' & 'No Naked Flames' should be placed around the fuel storage area.	PC	No signs were observed, but employees are well aware that fuel products are highly flammable.
		64. Permits: Ensure that the necessary permits, i.e. Consumer Installation Certificate is obtained from the relevant line ministry.	FC	A permit has been obtained.
Fire Prevention Management		65. Fire Fighting Equipment: Ensure an adequate number of fire extinguishers is provided, functional, easily accessible and personnel is trained in the use of such equipment.	PC	No evidence of non-compliance was noted.
		66. Open Fire: Only in designated places may open fire be allowed. No open fire must be made in the vicinity of fuel storage place.	FN	Management has taken note of the EMP requirement.
		67. Smoking: No smoking or open fire is allowed in the vicinity of flammable substances.	FN	Employees are made aware of this requirement.
Management of Heritage & Cultural Items	Safeguard any findings of archaeological or cultural nature.	68. Chance Find Procedure: In the event of an item of a cultural nature unearthed during quarrying activities, work should be stopped immediately, the area barricaded and the office of the NHC notified.	FN	Management has taken note of the EMP requirement.
		69. Human Remains: In the event human remains are uncovered work must be stopped, area secured and the police and officials from NHC called out to the site.	FN	No new quarry pits were made, otherwise management is aware of the EMP requirement.
		70. Instructions: Comply with instructions provided by officials of NHC and or the police with respect to items of cultural nature.	FN	The requirement has been noted by management.
		71. Stockpiles: Keep heights of stockpiles as low as possible to reduce visual impacts.	FN	Management has taken note of the requirement.
Management of Visual Impacts		72. Dust suppression: Use effective dust suppression methods including spraying with water to avoid dust escaping into the atmosphere becoming a visual nuisance.	FC	Dust suppression methods are being employed by management to limit dust impacts both inside and outside the quarry premises.
		73. Plastics & Papers: Avoid the quarry becoming a visual annoyance by regularly picking up windblown papers and plastics around the premises – inside and outside the quarry premises.	FC	Windblown papers and plastics are a being problem in the village but the quarry premises and the surrounds were found litter-free.
		74. Lighting: Direct any lights used for security purposes at night inwards and outwards to the villages.	FC	No evidence of non-compliance was observed.

6. MONITORING

6.1. MONITORING PERFORMANCES

A simplified environmental monitoring performance indicators has been added to the EMP and is intended to assist Crushco management on early detection of environmental impacts, and to take corrective actions timely and where deemed necessary, to report such impacts to the authorities.

TABLE 5: MONITORING OF QUARRYING ACTIVITIES

Environmental Aspects & Mitigation Measures	Compliance	Follow Up Action	By Whom	Date Completed
1. Land and Soil Disturbances				
Has any new virgin land been cleared of vegetation for quarrying?				
Is there any deviation from the provisions in the EMP on land disturbances?				
Was the area to be cleared preceded by planning, surveying and clearly demarcated?				
Was any access route to the new area planned and clearly demarcated?				
2. Solid Waste Disposal (household waste, office, etc.)				
Are there any deviations from the provisions contained in the EMP on solid waste handling and disposal?				
Are there any litters around the quarry premises, windblown papers, plastics, empty bottles, etc.				
Are the measures as recommended in the EMP adequate to deal with the solid waste generated at the HRQ?				
3. Sewage Waste Management				
Any there any deviations in the EMP on the sewage system?				
Was the sewage system regularly inspected and pumped out when full?				
4. Oil Spillage and Used Oil				
Are there any deviations from the provisions in the EMP on oil spills and on how to handle used oil?				
Has any oil spill occurred during the quarrying period? If, yes, how was that handled?				
Have the employees been trained on the procedure on how to contain any spills that may occur?				
5. Dust Impacts on Air Quality				
Are there any deviations from the provisions in the EMP on dust mitigation measures?				
Has any complaint been received from any stakeholders with respect to dust generated by the HRQ operation?				
Are internal routes regularly maintained and spread with gravel in order to combat dust?				
Is the speed limit on internal routes being complied with?				
6. Noise and Blasting Vibrations				
Are there any deviations from the provisions of the EMP on noise and vibrations?				

Environmental Aspects & Mitigation Measures	Compliance	Follow Up Action	By Whom	Date Completed
Is adequate warning given to all stakeholders including neighbouring residents prior to carrying out any blasting activity at the quarry?				
Are machinery, trucks and LDV regularly serviced and redundant exhausts replaced to ensure minimal noise generation?				
Has any complaint been received on noise or vibrations from blasting received from any stakeholders?				
7. Landscapes and Visual Intrusions				
Are there any deviations from the provisions of the EMP with respect to landscape and visual impact mitigation measures?				
Are topsoil stockpiles kept at low heights and vegetated in order to prevent soil erosion and to decrease visual disturbances?				
8. Surface Water, Drainage and Underground Water				
Are there any deviations from the provisions of the EMP with respect to surface water, drainage and groundwater?				
Are areas which suffered soil erosion during the wet season, inspected and corrective measures taken to prevent further erosions?				
9. Traffic Impact on National Roads				
Are there any deviations from the provisions of the EMP on traffic impacts on national roads?				
Are trucks loaded to the required payloads and not overloaded?				
Has any complainant been received from any stakeholders regarding any traffic violations?				
10. Biodiversity (Fauna and Flora)				
Are there any deviations from the provisions of the EMP on biodiversity?				
Is land clearing kept to the minimum possible area where dolerite rock occurs and is preceded by careful planning of access routes as well as areas where to site stockpiles for topsoil and products?				
Are big trees and trees where any bird are nestling avoided during land clearing?				
Are employees trained to preserve all forms of life during land clearing and quarrying activities, i.e. reptiles such as snakes should not be skilled unless where it poses a danger to humans.				
11. Aspects Related to Archaeological and Cultural Interests				
Are there any deviations to the provisions of the EMP with respect to archaeological and cultural matters?				
Have employees received training on issues related to archaeological and cultural interests?				
Are employees informed on what to do in the event an item of cultural or archaeological interest being unearthed during the quarrying operations?				

6.2. ENVIRONMENTAL CODE OF CONDUCT

To improve its overall environmental compliance measures as stipulated in the EMP, it is proposed to recommend a set of Environmental Code of Conduct which CRUSHCO Management should strive to implement once its quarrying activities are resumed.

The code of conduct should apply to all current and future employees of CRUSHCO, clients visiting the quarrying premises, contractors hired to perform certain functions at the quarry such as the drilling and blasting crew and any visitors entering the quarry facility.

In terms of this Environmental Code of Conduct, the Quarry Manager is authorized to issue warning and to discipline any person who transgresses environmental rules and regulations.

TABLE 6: ENVIRONMENTAL CODE OF CONDUCT

ENVIRONMENTAL CODE OF CONDUCT
HEALTH AND SAFETY GUIDELINES
<p>Covid-19 Protocols:</p> <ul style="list-style-type: none"> • Respect the regulations provided for the Covid-19 pandemic. • Wear a suitable face mask. • Sanitize your hands regularly. • Avoid large social gathering such as weddings, bars, funerals, etc. • Seek treatment when feeling unwell. • Get vaccinated. <p>Water:</p> <ul style="list-style-type: none"> • Do not drink water collected in the quarry pit or water used to spray internal routes. • Only drink water supplied by the company or purified water. <p>HIV/AIDS Virus:</p> <ul style="list-style-type: none"> • Take the necessary precautions to avoid contracting the HIV/AIDS virus. • Take the necessary precautions to avoid contracting diseases. <p>Restricted Areas:</p> <ul style="list-style-type: none"> • Do not enter an areas marked as restricted or demarcated as dangerous, i.e. a blasting area without permission. • Do not enter any area that is out of bound or fenced in by climbing over the fence without the permission of the QM. • Do not enter an area marked 'PPE required' unless wearing suitable PPE. • Any stranger or unauthorized person found wandering around in the quarry premises must be reported to the QM. <p>Housekeeping Rules:</p> <ul style="list-style-type: none"> • The use of drugs on duty is strictly forbidden. • Coming to work while intoxicated is strictly forbidden. • Dangerous weapons such as knives and guns are not allowed on the company premises. • Possession of dangerous weapons such as guns and knives at work is strictly forbidden.
FAUNAL AND FLORAL MANAGEMENT GUIDELINES
<p>Faunal Guidelines:</p> <ul style="list-style-type: none"> • No feeding, teasing or playing with, hunting, killing or setting devices to trap birds and livestock is allowed. • No food items should be left around to attract animals, birds and or insects. Leftover food items must be placed in a waste bin with a lid such that animals do not gain access. • When clearing land for quarrying purposes, any sensitive habitats should be avoided.
<p>Floral Guidelines:</p> <ul style="list-style-type: none"> • No cutting or harvesting of any plants and or trees for whatever purposes is allowed. Dead trees within the quarry premises may be collected for firewood. • Trees in which birds are nestling must be avoided and not uprooted. Any bird nestling must not be disturbed. • Internal routes should not be sited over sensitive habitats for plants.
GUIDANCE WITH RESPECT TO DISPOSAL OF SOLID AND LIQUID WASTE
<ul style="list-style-type: none"> • Train employees on the various types of waste: general waste and hazardous waste. • Train employees on how to identify waste bins, drums or bags for the different types of waste. • Educate employees to appreciate the importance of not littering or throwing away waste anywhere on the quarry, not to throw waste in the field or along the road. • Under no circumstances should waste be buried on site. • Urinating and or defecating at any other place other than using the toilets provided is prohibited.

ENVIRONMENTAL CODE OF CONDUCT
<ul style="list-style-type: none"> • Waste in bins should be disposed of at regular intervals and the bins cleaned and the surrounds kept clean and tidy.
GUIDELINES WITH RESPECT TO QUARRY ACCESS AND VEHICLE USES
<ul style="list-style-type: none"> • No vehicle must be driven unless it is roadworthy and has a valid Licence. Any driver refusing to operate a vehicle that is not roadworthy and without valid licenses should not be reprimanded. • No third party truck should be loaded with aggregate unless it has a valid license and a MDC logbook. • No driver must operate a vehicle/truck when intoxicated. • Vehicles should be operated on demarcated internal routes and off-road driving is prohibited. • Vehicles operated on public roads must not be overloaded and drivers must adhere to the speed limit. • Unnecessary machine idling, revving and hooting must be avoided.
GUIDELINES WITH RESPECT HAZARDOUS WASTE
<ul style="list-style-type: none"> • Hazardous substances such as oil filters should not be discharged into natural watercourses or buried in the soil. • Any accidental spills of hazardous substances must be immediately contained and corrective action taken. All hazardous spills must be reported to the QM. • Under no circumstances may hazardous substance waste be allowed to soak into the soil. • Any leaks or spillage of hazardous substances, unhygienic conditions at the ablution facilities must be immediately reported to the QM and corrective measures taken.
GUIDELINES WITH RESPECT TO ENVIRONMENTAL RELATED COMPLAINANTS
<ul style="list-style-type: none"> • Any complaint reported by any stakeholder with respect to working conditions, noise, dust, violations of road regulations by truck operators, pollution or any other harmful or dangerous condition must recorded, investigated and corrective action taken. • Where warranted, feedback should be provided to the complainant.

7. CONCLUSION AND RECOMMENDATION

7.1. CONCLUSION

CRUSHCO was granted an ECC for its aggregate quarry at Kangongo Village in the KEA, on 25 March 2019. The quarry has been in existence for over forty years. It is significant to mention that the award of the ECC had coincided with a massive economic recession which hit the construction sector following the end of the N\$14 billion TIPEEG projects. While the operation has continued throughout the validity period of the ECC, actual quarrying was carried out at about 40% of plant capacity.

Based on the findings of the compliance assessment, out of the 60 assessable conditions, Crushco was found fully compliant with a score of 83.34%. Partial compliant and non-compliant scores were 13.33% and 3.33% respectively.

The company has strived to re-align its quarrying operation with all applicable regulations including securing associated licenses and permits (ECC, Water Abstraction Permit, Consumer Installation Certificate, etc.).

EMP has highlighted the need for management measures with respect to developing an Environmental Awareness Plan and an Emergency Preparedness and Response Plan for the operation.

With about 15% of the Namibian population resident in the three regions served by Crushco, the aggregate quarry has a vital and beneficial role to play in the economic setups of such regions and should be supported. Minimal disturbance to the environment should be expected, but with the recommendations as suggested in this updated EMP, and the fact that CRUSHCO is committed to implementing such measures, quarrying at Kangongo can be carried out, in a manner which is technically feasible and environmentally sustainable.

7.2. RECOMMENDATION

Generally, the aggregate quarry was found to be well organized and well managed. Furthermore, management is committed to implementing and to complying with the provisions of the EMP.

It is recommended that the ECC be renewed.

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APPENDIX A

Environmental Report for the Period March 2019 to March 2022





Prepared for : Crushco Trading CC

**Title : Environmental Report for the Period
March 2019 – March 2022**

Date : May 2022

TABLE OF CONTENT

ABBREVIATIONS AND ACRONYMS	v
DEFINITIONS	v
1. BACKGROUND	1
1.1 Introduction	1
1.2 Scale of the Operation	1
1.3 Aggregate Products	1
1.4 Employment.....	1
1.5 Quarry Life	1
2. THE RECEIVING ENVIRONMENT	3
2.1 Site Topography and Soil.....	3
2.2 Geology.....	3
2.3 Land Use.....	3
2.4 Access to the Resource	4
2.5 Climatic Condition	4
2.6 Surface water	4
2.7 Underground Water.....	6
2.8 Air Quality	6
2.9 Archaeological and Cultural Heritages	6
2.10 Biodiversity.....	7
3. ENVIRONMENTAL MANAGEMENT AT THE QUARRY	8
3.1 Introduction	8
3.2 Statutory Compliance.....	8
3.3 The Management System	8
4. ENVIRONMENTAL PERFORMANCES	10
4.1 Introduction	10
4.2 Performances.....	10
4.2.1 Resource Management.....	10
4.2.2 Waste Management	12
4.2.3 Air Quality Management.....	12
4.2.4 Management of Biodiversity.....	13
4.2.5 Traffic Impacts on Public Roads	13
4.2.6 Health and Safety.....	13
4.2.7 Rehabilitation.....	14
4.2.8 Closure Planning.....	14

FIGURES

Figure 1: Quarry Location Regional Context	2
Figure 2: Quarry Location Village Context	2
Figure 3: Quarry Layout	2
Figure 4: EIA meeting held in Q3 - 2018	2
Figure 5: Traditional Authorities in the Kavango Regions	2
Figure 6: Crushing & Screening Plant Section	5
Figure 7: Off-road Earthmoving Machinery	5
Figure 8: Quarry Pit - Feb 2020	5
Figure 9: Quarry Pit - June 2020	5

TABLES

Table 1: Statutory Requirements/Permits	8
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ABBREVIATIONS AND ACRONYMS

Term	Expansion
COVID-19	'CO' - Corona, 'VI'- Virus & 'D' - Disease of 2019
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
ha	hectare (1 ha = 10 000 m ²)
HRQ	Hard Rock Quarry
HTA	Hambukushu Traditional Authority
IAPs	Interested and Affected Parties
ISO	International Organization for Standardization
KER	Kavango East Region
KWR	Kavango West Region
LPG	Liquefied Petroleum Gas
m ²	square meters
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MHSS	Ministry of Health and Social Services
MME	Ministry of Mines and Energy
NHC	National Heritage Council
NSI	Namibia Standards Institute
PPE	Personal Protective Equipment
ROM	Run of Mine
SHE	Safety, Health & Environment
SME	Small and Medium Enterprises
TDS	Total Dissolved Solids
TIPEEG	Targeted Intervention Programme for Employment and Economic Growth

DEFINITIONS

Term	Expansion
Aggregate Reserve:	Reserve is that amount of the resource which has been quantitatively proven through drilling and other sampling methods for which the level of confidence is high.
Aggregate:	Aggregate is defined as granular raw materials consisting of gravels, crushed stones, recycled concrete stones, building and plaster sand. Primarily, aggregates are used in the manufacturing of construction products which in turn are used widely in the built environments and road transport infrastructures. When using a square sieve with an aperture of 4.75 mm, 90% of sand will pass through a square sieve whilst at least 90% of coarse stone will be retained by such a sieve. The coarse stones retained on the sieve will constitute aggregates.
Biodiversity:	The variability among living organisms from all sources including terrestrial marine and other aquatic ecosystem and ecological complexes which they are part of

Term	Expansion
Cumulative Impacts	In the context of quarrying, cumulative impacts would mean the impacts of quarrying activities which in themselves may not significant but may become significant when added to the existing and potential impacts resulting from similar or diverse activities or underrating in the area.
Environment:	All physical, chemical and biological factors and conditions which influence an object and or organism. It is also defined as the surroundings within which human beings exist and is made up of the land, water, atmosphere, plants and animal life (micro and macro) including interrelationships between the factors and the physical or chemical conditions that influence human health and well-being
Environmental Impact:	Environmental impact is any change to the environment whether adverse or beneficial, wholly or partially, resulting from an organization activities, products or services
Environmental Management Plan (EMP)	A working document which contains site-, project-, or facility-specific plan developed to ensure that environmental management practices to eliminate and control environmental impacts are followed during the developmental phases of that site, project and or facility and would normally consist of construction phase, operational phase and decommissioning phases. Commissioning and Operation phases.
Environmental Monitoring	The collection, evaluation and summarization of environmental data by continuous or periodic monitoring of certain qualitative and quantitate indicators characterizing the state of environmental components and their modification as a result of the impact of natural and anthropogenic factors.
General Waste	Waste that does not pose an immediate threat or hazard to health or the environment and includes: domestic waste; building rubble and demolition waste; business waste; and inert waste.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have detrimental impact on health and the environment.
Interested and Affected Parties	All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project, including neighbouring landowners & Road Fund Administration.
Quarry:	A quarry is an open pit or excavation made in the ground from which non-metal resources such as dimension stones, rock, construction aggregates, sand, gravel or slate are extracted (quarried) from.
Sensitive Area	A sensitive area or environment is described as an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is high potential for ecotourism

1. BACKGROUND

1.1 Introduction

Crushco Trading CC (henceforth 'Crushco'), an SME company is operating a hard rock quarry (HRQ) situated at Kangongo, a small village in the Mukwe Electoral Constituency, Kavango East Region (KER) (Fig. 2). Kangongo is approximately 160 km northeast of Rundu. The HRQ is approximately 800 m from the current banks of the Kavango River. Quarrying has been conducted at this site for over 40 years and was acquired by the current owner, Crushco, in November 2015.

1.2 Scale of the Operation

Given an ideal market, Crushco can quarry up to 60 000 tons as run-of mine (ROM) per year, working a single shift of 8 hours per day, 300 days per year at an efficiency rate of 85%. The crushing and screening plants (Fig. 6) can process between 50% and 60% of ROM, working on the same basis. Over the last three years, annual production levels have been the lowest in years, primarily because of subdued activities in the domestic construction sector. On average, ROM was about 50% while crushing and screening throughput were about 40%.

1.3 Aggregate Products

Crushco quarries and produces these stone products:

- 19 mm stones for concrete and road surfacing
- 13.5 mm stones for concrete
- 9.5 mm stones for concrete and
- 6.75 mm stones for the manufacturing on cement based products
- 4.75 mm crusher dust for road building, etc.

From the quarry, aggregate is delivered to construction sites all over the regions of Zambezi and Kavango West and Kavango East (Fig. 1). Significant volume is also exported via the Mohembo border post, to the neighbouring districts of Ngamiland and Nganzi of Botswana.

About 90% of the 6.75 mm and 4.75 mm aggregates are used as raw materials in the manufacturing of building materials (bricks, pavers, road kerbs) at the company's factory in Rundu.

1.4 Employment

On its payroll, Crushco has a workforce of 60 employees, 42 at the brick factory in Rundu and 18 working at the quarry. When the construction sector was at its peak during the TIPEEG period, the company had over 30 non-permanent employees. Crushco's employees are well remunerated way beyond the industry benchmark.

1.5 Quarry Life

Measured rock reserve is 1.3 million tons which gives the quarry a production lifespan in excess of 30 years at the extraction rate of 40 000 tons per annum. Inferred reserve is much high and can sustain the aggregate quarrying operation for many years into the future.

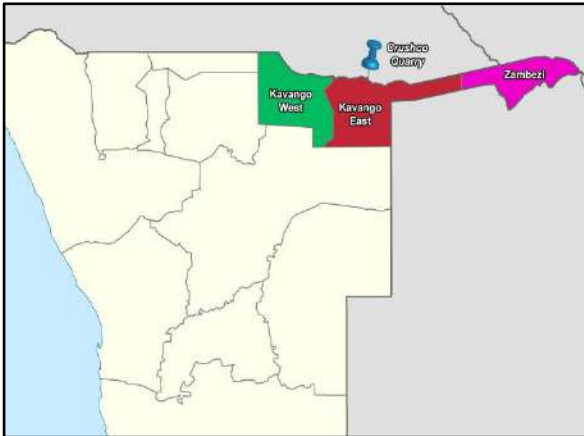


Figure 1: Quarry Location Regional Context



Figure 2: Quarry Location Village Context



Figure 3: Quarry Layout



Figure 4: EIA meeting held in Q3 - 2018



Figure 5: Traditional Authorities in the Kavango Regions

2. THE RECEIVING ENVIRONMENT

2.1 Site Topography and Soil

The topography at Kangongo is generally flat without undulating landscapes. Nowhere does the land rise as high as 50 m, however a gentle slope is observed to the NW – towards the river about 800 m away. Minor rock outcrops were observed to the north and northwest of the quarry. Large tracks of land have been de-bushed and cleared all around the quarry.

Overall, the area is characterized by loamy and Kalahari sandy soils and is believed to be fertile, especially in the immediate area south of the river. The general elevation varies between 900 m to 1 100m above sea level.

2.2 Geology

Quartzite rock of the Nosib Formation constitutes the aggregates quarried at Kangongo. Geologically, the Nosib Formation is considered to represent the lowest stratigraphic unit of the Damara Supergroup formed around 900 million years ago. With few exceptions, the Nosib quartzite does not naturally outcrop outside the Okavango River, and is generally covered by sandy and calcrete sediments of the Kalahari Formation.

At this specific location, the Nosib quartzite is encountered at relatively shallow depths and over a large area. This rather interesting discovery was confirmed via satellite imagery, which indicated that, where the quartzite exists within a few meters below the earth surface, the ground had a peculiar 'speckled' appearance. The reason for this identification was that, where the quartzite rock occurred above the ground water table, termites have carried fragments of the weathered rock to the surface leaving the indicative 'white specs' seen on several terminate hills in the area.

Typically, the Nosib rocks would consist of orthoquartzite with conglomerate horizons and these have been deposited in a fluviate/delta environment. The main rock constituent is quartzite while fuchsite (clay mineral), hematite and feldspar are minor constituents. Through pressure (metamorphism) and high temperatures, the mineral components were re-crystalized resulting in individual quartz grains becoming dense and compact structures with little porosity. The result was a strong rock, hardly affected by weathering and therefore suitable for commercial applications.

2.3 Land Use

The quarry is on communal land, which, in terms of the Communal Land Reform Act falls under the custodian of the Hambukushu Traditional Authority (HTA) as can be seen in **Fig.5**. The predominant land use for the land between the banks of the Kavango River and B8 tar road is crop cultivation, mostly mahangu and livestock rearing. Traditionally, each rural family household is allocated a small parcel of land usually not exceeding 5 ha where mahangu (pearl millet) is cultivated mostly for own household consumption.

In recent years, government through the MAWLR has established huge irrigation schemes along the Kavango River intended to help the country become self-sufficient in terms of food production.

2.4 Access to the Resource

All previous quarry operators have gained access and worked the resource through a lease agreement which provided annual payment of N\$24K to HTA. When it acquired the quarry, Crushco had expected to continue with the same protocol, however, HTA had other ideas. In addition to the annual payment of N\$24K, HTA had proposed three new additional conditions to the lease agreement, as follows:

- HTA is to become a 50% shareholder in the quarrying company, essentially free carried and without assuming any liabilities.
- In the event of Crushco alienating the quarry to a third party, HTA is entitled to 10% of the proceeds.
- All employees at the quarry have to be exclusively from HTA.

Crushco had no qualms with the annual payment, but the above three conditions were unworkable and possibly in conflict with the Constitution of the country. A proposal to HTA to have a formal agreement drawn up by a legal practitioner at the cost of Crushco was not entertained. In the absence of a signed lease agreement, Crushco has withheld the annual payment (N\$24 000) due to HTA.

The relationship between the parties has remained hostile with no progress being made to finalize the lease agreement. At one point, Crushco was served with an eviction order by HTA and when the eviction did not succeed, HTA has resorted to stoking village residents to revolt against the company. To safeguard its investment which runs into tens of millions, Crushco has roped in its lawyers to take up the matter with HTA.

2.5 Climatic Condition

Since November 2015 when Crushco acquired the quarry, average annual rainfall has ranged between 450 mm and 600 mm with most precipitation occurring between November and March. During the rainy season of 2019/2020, the highest rainfall of 1 100 mm was recorded at the Kangongo Village which resulted in the quarry pits being flooded. It was the first time in the history of the quarry operation that heavy rainfall has flooded the pit (**Figures: 8 & 9**).

Daily maximum temperatures range between 38 °C and 28 °C while night minimum temperatures range between 8 °C and 20 °C.

2.6 Surface water

During the rainy season, substantial amount of rainwater is collected in the quarry pits. Surface run-off /storm water from the south which includes the workshop and other infrastructure enters the quarry pit (**Figures: 3, 6 & 7**). This can be easily avoided by constructing a shallow flood bund to protect the southern extent of the quarry pit.

Over the years, dewatering of the quarry pits has been managed by pumping water via a 25 mm diameter pipe to a silt retention storage pond located outside the quarry premises. The silting pond was not fenced in and during the public consultation held at the village, concerns were raised by some residents complaining that the water was not fit for livestock consumption. Two incidents of drowning have also been linked to the pond. Some residents have no problems with the pond saying that it has been there for over 30 years. There was even fish which the villagers caught and enjoyed eating.

The silting pond has since been fenced in with no access allowed to the livestock and to the villagers to catch fish.



Figure 6: Crushing & Screening Plant Section



Figure 7: Off-road Earthmoving Machinery



Figure 8: Quarry Pit – Feb 2020



Figure 9: Quarry Pit – June 2020

2.7 Underground Water

There are no known boreholes drilled around the Kangongo village and as such the level of the groundwater table is unknown. Certain sections of the quarry pit have been extracted down to a maximum depth of approximately 12 meters from the quarry surface. According to the observations made by management, the quarry pits were completely pumped out and no water inflows from below the quarry pit could be observed. This was an indication that the current bottom level of the quarry did not extend below the groundwater table. It was therefore concluded that quarrying activities will have a negligible impact on groundwater levels, groundwater quality and groundwater receptors.

2.8 Air Quality

Atmospheric conditions around any aggregate quarry are prone to airborne dust and other impurities, a situation which is enhanced by air movements. There were no wind speed measurements taken around the quarry, but the predominant wind direction is from east to west. Potential for the transport of dust and other impurities via atmospheric pathways towards inhabited areas is dependent on the direction of the receptor points relative to wind direction. The crushing and screening plants (**Fig. 6**) have been positioned in such a way that the dust generated by such plants is picked up by the wind and blown away from the working areas and the village.

The Kangongo village where the school and clinics are situated, is to the south of the quarry and does not therefore lie in the direction of predominant wind. The land NW of the quarry has been cleared of vegetation but has been lying fallow without any cultivation taking place for many years.

Generally, deposited dust is not a health hazard, but because it is visible it could be the cause of public complaints. In suspension, dust particles with a diameter of less than 10 μm (micrometer) can be inhaled by humans. This kind of hazard is determined by concentrations of dust and the period of exposure. It is not only human health that can be adversely affected by dust, but the fall-out of heavy metals onto soil and the foliage of plants can also result in adverse environmental impacts.

Within a quarry set up, and as observed at the Crushco quarry, dust is generated from three main sources:

- point source - which includes the crushing plant and earthmoving machinery;
- line source - which includes internal quarry routes and conveyor belts; and
- dispersed source - which involves topsoil stripping, stockpiles of products, wastes and fine materials.

In generally, the main sources of dust at any quarry operation are the crushing and screening activities, stockpiles, movements of traffic on internal routes and from occasional blasting of rock. These are dispersed sources rather than specific point sources and to a large extent can dictate the measures which have to be taken to mitigate potential dust related impacts.

2.9 Archaeological and Cultural Heritages

During the public consultation held with the members of the Kangongo community in last quarter of 2018 (**Fig. 4**), participants were specifically asked if they had any knowledge of any sites of cultural interests (burial sites, past human activities, etc.) within or near the quarry premises. Of special interest was an old pre-primary school building constructed by the Roman Catholic Missionary at the village in the late

forties. The structure would probably be a good candidate for qualification as a cultural heritage structure of significance, and funds permitting, possibly be preserved for future generations.

The distance between this historical building and the quarry is ± 650 m and therefore too distant to be impacted directly or indirectly by the quarrying activities. There were no known items of historic or cultural heritage significance within the village of Kangongo

2.10 Biodiversity

Large tracks of land all around the quarrying have been de-bushed and cleared of vegetation in order to make way for agricultural activities. However, according to the residents the land has been lying fallow for many years without any cultivation. This was also clear from the extent of vegetation regrowth observed on the cleared land.

Human activities such as the establishing of settlements, villages, construction of traditional homesteads (using predominantly timber materials, reeds and thatch grass) and chopping down trees for firewood are still practiced to this day and have contributed to considerable land degradation.

For many years now, the forest of the KEA has been a source of good quality thatch grass harvested by the locals during the spring and summer months. Thatch grass is used widely in the construction of lodges and other environmentally friendly accommodation establishments throughout Namibia, Botswana and South Africa.

Within the quarry premises, topsoil stripping to expose the rock resource below the soil surface has, inevitably resulted in vegetation clearance. However, big trees have been spared and vegetation growth allowed to re-establish on the topsoil stockpiles. There were trees or plants with conservation status reported in the area.

Livestock cattle, goats and sheep are reared by the locals and are often encountered in the vicinity of the quarry. To prevent access to the active quarry areas, a high meter security fence has been erected around the workings (represented by the blue line in **Fig. 3**) with access provided via a single gate which is manned by a security official.

Close to the river which is 800 m from the quarry, numerous bird species are encountered. Different types of snakes are also common in the village.

On a yearly basis, crocodiles have attacked and killed people in KEA, in many cases victims were attacked when fetching water or swimming in the river. The number of crocodiles was reported as increasing which is a concern to the many people in the region especially those depend on the river for their livelihood.

3. ENVIRONMENTAL MANAGEMENT AT THE QUARRY

3.1 Introduction

The quarry operated by Crushco is managed by an experienced and skilled person with the formal designation of a Quarry Manager (QM), who ensures that all impacts on both the biophysical and socio-economic environment, are avoided or reduced to acceptable levels. It is also the responsibility of the QM to ensure that all operations are governed through applicable national legislations and regulatory frameworks.

3.2 Statutory Compliance

Since acquiring the quarry in November 2015, Crushco has endeavoured to comply with applicable laws and regulations that govern its operational activities. Some of these are:

TABLE 1: STATURY REQUIREMENTS/PERMITS		
Aspect	Regulatory Framework	Status/Remarks
Environmental Clearance Certificate (ECC)	Environmental Management Act, No. 7 of 2007	ECC obtained and is being renewed.
Water Abstraction Permit from a natural water source (WA002)	Water Act, No. 54 of 1956	Permit obtained
Dewatering Permit	Water Act, No. 54 of 1956	The EMP to be amendment to mitigate impacts associated with dewatering
Mining Licence over a Mineral Resource	Minerals (Prospecting & Mining) Act, Act 33 of 1992	Application pending
Construction of accessory works on a mining/quarry site (administrative offices, workshops, accommodation)	Minerals (Prospecting & Mining) Act, Act 33 of 1992	Application to be made once Mining Licence has been approved.
Permit to store and handle explosives	Explosive Act, No. 26 of 1956	A third party is conducting blasting and handling the transport and storage of explosives.
Consumer Installation Certificate	Petroleum Products and Energy Act, No. 13 of 1992	Fully compliant
Income Tax	Income Tax Act, No. 24 of 1981	Fully compliant
Value Added Tax	Value Added Tax Act, No. 10 of 2000	Fully compliant
Social Security	Social Security Act, No. 34 of 1994	Fully compliant
Affirmative Action Compliance Certificate	Affirmative Action Act, No. 29 of 1998	Not applicable
Approval to work on Public Holidays and Sundays and continuous operation	Labour Act No. 11 of 2007	Not applicable

3.3 The Management System

For its aggregate production, Crushco Management has been considering to implement an Environmental Management System (EMS) which conforms to international standards such as ISO 14001. The EMS would enable all personnel working for Crushco, and third parties doing business with the company to carry out their duties in a manner which preserves the environment around them.

With the EMS all potential impacts are listed on a risk register, with related mitigating and operational controls. Based on an understanding of potential health, safety and environmental hazards or aspects, the EMS will enable Crushco to identify key aspects and impacts, guide operating procedures and attain to continual improvements in management of such.

However, an investment in such a system was not justifiable on the backdrop of reduced demand for aggregates and related products in the market, primarily, due to prevailing economic recession in the local construction sector.

Overall, the environmental management promoted by Crushco at the quarry has the aim to achieve the following objectives:

- To assess the environmental impacts of quarrying activities throughout the entire operational process.
- To develop, implement and manage monitoring system to ensure maximizing of avoidance, mitigation and rehabilitation of adverse environmental impacts.
- To comply with environmental regulatory and legislative frameworks during all phases of the quarry's operations.
- To maximise positive environmental impacts.
- To limit contamination through prevention measures.
- To keep the community of Kangongo informed and involved on those aspects that have a bearing on their health and safety.
- To ensure the health and safety of its employees, third parties and or visitors to the quarrying operation.
- To support and encourage awareness, training and responsibility of environmental management.

4. ENVIRONMENTAL PERFORMANCES

4.1 Introduction

This environmental performance report covers the period starting from 25 March 2019 when Crushco was awarded an ECC for its quarry up to 24 March 2022.

Crushco has committed itself to adhere to the terms and conditions contained in the EMP. To this end, no significant environmental incidents or accidents occurred during the reporting period and no deviation from the EMP is reportable to the respective authorities.

4.2 Performances

During the period under review, environmental performances are described in the following aspects:

- Resource Management
- Waste Management
- Management of Air Quality
- Biodiversity and Ecological Management
- Traffic Regulations
- Occupational Health and Safety
- Rehabilitation and Closure Planning

4.2.1 RESOURCE MANAGEMENT

4.2.1.1 FUEL

Fuel (diesel) is procured and delivered to the quarry in bulk quantities of 20 000 liters per delivery by a dedicated fuel supplier where it is stored in an aboveground storage tank. The storage tank was provided by the fuel supplier who is also responsible for its maintenance and upkeep. The location of the surface tank, fuel delivery, safety protocols around the fuel tank and refueling procedures are in line with the provisions of the EMP.

At peak aggregate production, fuel consumption could be as high as 30 000 liters per month. Over the last three years, average consumption per month has been at 60% of peak consumption rate. Records of fuel used are kept on a daily basis and reconciled with the balance of the fuel in the storage tank. Fuel is used and handled judiciously because it is an expensive commodity and highly flammable.

Given the remoteness of the quarry, adequate volumes of lubricants, greases, as well as LPG are procured and stored in separate secured sections of the workshop.

A Consumer Installation Certificate has been secured from the MME.

Training on how to handle any spills has been provided to personnel. Any fuel spill of above 200 liters has to be reported to MME. No incidents related to fuel spill has occurred over the reporting period.

4.2.1.2 BLASTING CHEMICALS

Blasting is an integral part of any quarry operation. The hard rock is drilled and the holes loaded (charged) with blasting explosives in order to break the rock into manageable small pieces.

A facility for the storage of explosives and related accessories has been constructed at the site by the previous quarry operators. Crushco has outsourced all activities related to blasting to a third party. The

said third party is also responsible for all aspects related to the procurement of all explosive devices, transport, handling, storage and disposal of any unused or redundant explosive chemicals.

The onsite storage facility is therefore not being used now and Crushco is assessing any future needs for the storage facility or to have it altogether dismantled as part of its ongoing rehabilitation process.

When compared to the period March 2016 to March 2019 – the first three years after Crushco acquired the quarry, substantial fewer blasts were conducted over the last three years which resulted in reduced use of explosives and related accessories.

4.2.1.3 ELECTRICITY

Electricity and fuel consumptions are the main cost drivers in any quarry operation. The quarry is connected to the Nored grid. With electricity becoming increasingly expensive, management is looking into procuring alternative energy sources such as solar power in order to reduce its electricity bill.

The location of the quarry has adequate sunshine to justify the switch. In fact, quarrying is only performed during day light hours and any solar system installed could work independently from the national grid power.

Substantially curtailed production levels over the last three years have resulted in minimal electricity usage when compared to the same period of March 2016 - March 2019, the first three years when Crushco acquired the operation.

4.2.1.4 WATER USES

Water for human use is sourced from the Kavango River using a 6 000 liter water bowser. Crushco was granted a Water Abstraction Permit (No. 11477) with a maximum of 288 m³ per year for this purpose. Water for cleaning and dust suppression purposes is sourced from the silting pond or directly from the quarry pit.

Significant reduced production levels over the last three years have resulted in reduced water consumption of approximately 60% of the maximum permitted volumes.

It would appear that Crushco did not pay due attention to the management of rainwater catchment and surface run-off surface. During the scoping EIA, there were no surface water courses observed running directly on or near the quarry site. However, during the 2019 rainy season, over 1 100 mm of rainwater was received in the area which flooded the quarry.

A dewatering permit was applied from the line ministry but was declined because the water in the quarry pit was classified as Category D hence unfit to be pumped to the river. MAWLR has advised Crushco to construct an Evaporation Pond for the purpose of dewatering the pit. An EIA for the required Evaporation Pond has been done and annexed to this report as **Appendix B**.

The EMP has therefore been revised and amended to allow for the construction of a dewatering pond as well as for flood bunds to divert surface run-off/ storm water away the quarry pits. Hybrid water pumps will be considered when procuring the necessary dewatering pumps.

4.2.1.5 LAND USE

The extent of dolomitic quartzite rock quarried for aggregates is deposited on land measuring about 54, but the actual quarry footprint is ±8 ha. Clearing for any virgin land identified for quarrying activities is preceded by careful planning where sensitive areas and any habitats are identified, and avoided. Topsoil stripped from the surface is stockpiled aside for future rehabilitation of the quarry.

4.2.2 WASTE MANAGEMENT

Crushco is developing its waste management policy pinned on the principle of the 'waste hierarchy' which encourages: waste reduction, waste re-use, waste recycling, waste recovery and waste disposal.

4.2.2.1 SOLID WASTE

Household and office waste are placed in separate bins which are emptied regularly. Windblown papers and plastics inside and outside the quarry premises are collected on a regular basis.

4.2.2.2 HAZARDOUS WASTE

Hazardous waste such as used oil, used oil filters and any spills is stored in lead-proof drums and disposed of by taking such drums to Rundu. In general a high standard of housekeeping has been maintained at the quarry.

No complaint has been received from any stakeholder with respect to waste.

4.2.3 AIR QUALITY MANAGEMENT

4.2.3.1 ENVIRONMENTAL NOISE AND VIBRATIONS

According to the South African National Standard code of practice, SANS 10103:2008, which is applicable in Namibia, noise generated by routine operations of a quarry is compared to 45dBA day time limit for rural districts. The quarry is operated during day light hours only, and no operations are carried out after sunset.

There has been no environmental noise levels established at the quarry to serve as benchmarks, and it is therefore safe to assume that the quarry did not generate noise levels in excess of 45dBA. It is also worth noting that, in the entire existence of the quarry, there has been no public concern raised with the quarry management on environmental noise. The B8 tar road – one of the busiest roads in the country in terms of traffic volume is about 4 km from the quarry and to the SE.

During the three years, on average, one blasting was conducted per quarter and adequate notice was given to all potential affected stakeholders. Employees working in areas where noise levels were high are provided with suitable PPE.

4.2.3.2 ENVIRONMENTAL DUST

Dust is measured in particulate matter (PM) ranging in diameter from 10 to 50 micrometers. PM₁₀ is the measure of particles in the atmosphere with diameter of less than or equal to a nominal 10 micrometers. In the context of Crushco, principal emitters of dust are crushing and screening activities.

The company has plans to procure ±4 dust samplers and to place such devices at different locations around the aggregate quarry so as to help management understand the intensity of any dust emissions at various locations of its operation. However, with the crushing & screening plants operated below optimal production levels, due to limited aggregate demand in the market, it is feared that conducting dust samples under such circumstances will not reveal the whole picture, but possibly give a distorted position.

Management is committed to implementing dust monitoring stations for purposes of dust sampling during the next reporting period since it is anticipated that production levels will have gradually improved. Areas around stockpiles and all internal routes have been spread with crushed stones in order to

eliminate dust emissions. Employees working in areas where dust is regarded as being higher are provided with suitable dust masks and wearing thereof is strictly enforced by the company.

4.2.4 MANAGEMENT OF BIODIVERSITY

Consideration of preserving any habitats within and around the quarry premises is being made by Crushco. The basic principle adopted and promoted by Crushco is that of impact avoidance as a better alternative to impact mitigation and subsequent rehabilitation.

Clearing of any virgin land for new quarrying areas is therefore preceded by careful planning aimed at ensuring that quarrying is confined to exact areas where dolomitic quartzite rock mineralization occurs. Areas where to site topsoil stockpiles and any new internal routes are also identified during the planning period.

Workers are encouraged to safeguard and to preserve all forms of life. No killing of reptiles including snakes is allowed. Any bird nestling on trees within the quarry premises are not to be disturbed. Chopping down trees for wood harvesting within the quarry premises is also strictly forbidden.

No environmental incidents relating to poaching or illegal timber logging have been reported to quarry management during the reporting period.

4.2.5 TRAFFIC IMPACTS ON PUBLIC ROADS

On average eight (8) truck loads are loaded, per working day, from the quarry for delivery to end-users or to the value addition facility at Rundu. Given the number of trucks using the B8 tar road from Zambia and DRC to the port of Walvis Bay, the potential road traffic impacts resulting from the 8 truckloads handled by Crushco is considered insignificant.

The objective of the management employed by Crushco is to increase safety and to reduce the potential for vehicle related impacts on road users. All trucks are licensed, roadworthy, operated by responsible licensed drivers and all payloads weighed on a weighbridge before leaving the quarry. Speed limits are also adhered to at all times.

Clients self-collecting products with their trucks from the quarry are expected to comply with road regulations.

No violations of road regulation involving Crushco's drivers were reported to the company during the reporting period.

4.2.6 HEALTH AND SAFETY

At the quarry, Crushco is promoting health and safety whose objectives are to ensure:

- A healthy and safety work environment.
- Safe system of work.
- Safe plant and equipment.
- The availability of such information, instruction and training as required for worker's health and safety.

Appropriate health and safety induction are given to all employees, contractors and visitors. Specific training sessions are in the process of being developed and will be provided to employees regarding specific health and safety skill sets.

Workers handling hazardous waste have received special training and correct personal protective equipment is provided.

Additionally, workers are encouraged to refrain from abusing alcohol, use of drugs and to take good care of themselves. Measures recommended for the Covid-19 pandemic have been implemented.

During the period under review, there has been no serious incident or accidents which occurred on the quarry premises.

4.2.7 REHABILITATION

The recommendation made in the EMP was for progressive rehabilitation of old worked out areas to be carried out in tandem with quarrying activities. Crushco is still committed to complying with the recommendation and a rehabilitation plan is currently being drawn up which entails mechanical activities such as demolishing of redundant infrastructure, getting rid of all scrap materials on the quarry, establishing geotechnical stability of the quarry slopes and protection against soil erosion.

4.2.8 CLOSURE PLANNING

The quarry would have a lifespan of over 30 years if extraction at the rate of 40 000 tons per year was maintained. Judging from the size of the capital investment made by the company, in the form of plant and machinery, there are no plans to cease with the quarrying operation anytime soon. As such, there is no consideration given to developing a closure plan.

APPENDIX B

Part 1 of 2

A Scoping Environmental Impact Assessment (EIA) Report for the Construction and Operation of an Evaporation Pond for the Purpose of Dewatering the Quarry Pit





Prepared for : Crushco Trading CC

PART 1 OF 2:

Title : A Scoping EIA Report for the Construction and Operation of an Evaporation Pond for the Purpose of Dewatering the Quarry Pit

Date : May 2022

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMSv

DEFINITIONS.....vi

1. THE AGGREGATE QUARRY7

1.1 Introduction7

1.2 Background.....7

1.3 Quarry Pit Flooded.....8

1.4 Evaporation Pond9

2. FORMAT OF THE EIA9

3. SITE DESCRIPTION10

3.1 Aggregate Reserve10

3.2 Estimated Water in the Pit10

4. APPLICABLE REGULATIONS & POLICIES12

5. BASELINE ENVIRONMENT14

5.1 Soil and Site Topography.....14

5.2 Climatic Conditions14

5.3 Land Use and Tenure15

5.4 Geological Conditions15

5.5 Hydrology (Surface and Groundwater)15

5.5.1 Surface water15

5.5.2 Groundwater.....15

5.6 Biodiversity16

5.7 Faunal Diversity:16

5.8 Floral Diversity16

6. DESCRIPTION OF THE ACTIVITY17

6.1 Assumptions17

6.2 Consideration for Options17

6.2.1 The ‘No Dewatering Option’.....18

6.2.2 Find an Alternative Quarry Site.....18

6.2.3 Pump the water to the river.....19

6.2.4 Use the Water for Irrigation Purposes19

6.2.5 Pump Water into an Evaporation Pond20

7. POTENTIAL IMPACTS FROM THE ACTIVITY22

7.1 Impact Identification22

7.2 Potential Environmental Impacts.....22

7.3 Impact Assessment Criteria22

8. IMPACT ASSESSMENT AND MITIGATIONS24

8.1 Land Resources.....24

8.1.1 Land disturbances24

8.1.2 Topography and Drainage:24

8.1.3 Soil Erosion:24

8.2 Impact on Water Resources:24

8.2.1 Contamination of groundwater.....24

8.2.2 Impact on Surface Water24

8.3 Impact on Air Quality.....24

8.3.1	Dust	24
8.3.2	Noise and Vibrations	25
8.4	Waste Management	25
8.4.1	Solid Waste	25
8.4.2	Hazardous Waste	25
8.5	Traffic and Transport	25
8.6	Health, Safety & Security	25
8.7	Impacts on Biodiversity	25
8.7.1	Floral Diversity	25
8.7.2	Faunal Diversity	26
8.8	Visual and Landscape Impacts	26
8.9	Heritage & Cultural Impacts	26
9.	CONCLUSION	28
10.	ANNEXURES	29
11.	REFERENCES	30

LIST OF TABLES

Table 1:	Regulations	12
Table 2:	Policies & Agencies	13
Table 3:	Potential Environmental Impacts	22
Table 4:	Assessment Methodology	23
Table 5:	Summary of Impacts	27

LIST OF FIGURES

Figure 1:	Quarry Location – Regional Context	8
Figure 2:	Quarry Location – Village Context	8
Figure 3:	Quarry Location in Relation to Rundu	8
Figure 4:	Quarry Pit Water Level – Feb 2020	9
Figure 5:	Quarry Pit Water Level – Jun 2020	9
Figure 6:	Proposed EP Site	11
Figure 7:	Water Basins in Namibia	21

ABBREVIATIONS AND ACRONYMS

Acronym	Expansion
EC	Environmental Commissioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
EP	Evaporation Pond
GPS	Global Positioning System
ha	hectare (1 ha = 10 000 m ²)
HPP	The Harambee Prosperity Plan
HTA	Hambakushu Traditional Authority
IAPs	Interested and Affected Parties
KER	Kavango East Region
KWR	Kavango West Region
m ²	square meters
m ³	Cubic meters (1 m ³ = 1000 litres of water)
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MHSS	Ministry of Health and Social Services
MME	Ministry of Mines and Energy
NHC	National Heritage Council
NSI	Namibia Standards Institute
PPE	Personal Protective Equipment
SHE	Safety, Health & Environment
SME	Small and Medium Enterprises
TDS	Total Dissolved Solids
TIPEEG	Targeted Intervention Programme for Economic and Employment Growth
List of Road Numbers	
B8	The route number of the road starting from B1 at Otavi to Katima Mulilo via the towns of Grootfontein, Rundu and Divundu. Today, B8 is known as the Trans-Capivi Corridor – a vital road providing access to land-locked countries of Zambia, Botswana and DRC to the sea route via the port of Walvis Bay.
C48/D3403	The route number for the road starting from B8 at Divundu to Mohembo Border Post – the border post between Namibia and Botswana

DEFINITIONS

Term	Expansion
Aggregate Reserve:	Reserve is that amount of the resource which has been quantitatively proven through drilling and other sampling methods for which the level of confidence is high.
Aggregate:	Aggregate is are defined as granular raw materials consisting of gravels, crushed stones, recycled concrete stones, building and plaster sand. Primarily, aggregates are used in the manufacturing of construction products which in turn are used widely in the built environments and road transport infrastructures. When using a square sieve with an aperture of 4.75 mm, 90% of sand will pass through a square sieve whilst at least 90% of coarse stone will be retained by such a sieve. The coarse stones retained on the sieve will constitute aggregates.
Biodiversity:	The variability among living organisms from all sources including terrestrial marine and other aquatic ecosystem and ecological complexes which they are part of
Cumulative Impacts	In the context of quarrying, cumulative impacts would mean the impacts of quarrying activities which in themselves may not significant but may become significant when added to the existing and potential impacts resulting from similar or diverse activities or underrating in the area.
Evaporation Pond	An artificial pond that is excavated with a large surface area that is designed to efficiently evaporate water by the actions of sunlight, wind and ambient temperatures.
Environment:	All physical, chemical and biological factors and conditions which influence an object and or organism. It is also defined as the surroundings within which human beings exist and is made up of the land, water, atmosphere, plants and animal life (micro and macro) including interrelationships between the factors and the physical or chemical conditions that influence human health and well-being
Environmental Impact:	Environmental impact is any change to the environment whether adverse or beneficial, wholly or partially, resulting from an organization activities, products or services
Environmental Management Plan (EMP)	A working document which contains site-, project-, or facility-specific plan developed to ensure that environmental management practices to eliminate and control environmental impacts are followed during the developmental phases of that site, project and or facility and would normally consist of construction phase, operational phase and decommissioning phases. Commissioning and Operation phases.
Environmental Monitoring	The collection, evaluation and summarization of environmental data by continuous or periodic monitoring of certain qualitative and quantitate indicators characterizing the state of environmental components and their modification as a result of the impact of natural and anthropogenic factors.
General Waste	Waste that does not pose an immediate threat or hazard to health or the environment and includes: domestic waste; building rubble and demolition waste; business waste; and inert waste.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have detrimental impact on health and the environment.
Interested and Affected Parties	All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project, including neighbouring landowners & Road Fund Administration.
Quarry:	A quarry is an open pit or excavation made in the ground from which non-metal resources such as dimension stones, rock, construction aggregates, sand, gravel or slate are extracted (quarried) from.
Sensitive Area	A sensitive area or environment is described as an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is high potential for ecotourism
Topsoil	This is defined as a horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic fraction. Topsoil is deemed, for the purposes of this EMP, as the layer of soil from the surface to the specified depth required for excavation.

1. THE AGGREGATE QUARRY

1.1 Introduction

This Environmental Impact Assessment (EIA) report has been prepared to support an application for the dewatering of the quarry pit operated by Crushco at the Kangongo Village in the Mukwe Constituency, in the Kavango East Region. The report also serves as an amendment to the Environmental Management Plan (EMP) which has been updated for the renewal of the ECC issued to Crushco by the Ministry of Environment, Forestry and Tourism (MEFT), on 25 March 2019.

1.2 Background

The Kangongo based quarry is a long-established operation having been in existence for over forty years. Over that period the quarry has changed hands for a record four times. It was acquired by Crushco in November 2015, who proceeded to realign the operation with applicable national laws, regulation and policies, a prerequisite somewhat neglected by the previous operators.

In June 2018, Ekwa Consulting was appointed by Crushco, to handle its ECC authorization process in terms of the Environmental Management Act of 2007. The ECC was eventually granted on 25 March 2019 and has since expired. However, a notice for the renewal of the ECC was submitted to MEFT in November 2021 and the application allocated this number: **APP - 003244**.

Throughout its many years of operation, the quarry did not experience any flooding of its pit. The current quarry floor is at a depth of approximately 12 m from the land surface while the total quarry covers a surface area of approximately 87 500 m² (8.75 ha). No groundwater issues has been noted within the current extent of the quarry workings.

The overburden which covers the dolomitic quartzite rock quarried for aggregates has a thickness varying between 1.5 m and 3.5 m. With this sand covering, there is no much surface run-off experienced during the wet seasons – all rainwater is almost absorbed into the thick sand. Consequently, the hard rock quarry was developed without any provision having been made to divert surface run-off away from entering the quarry pit.

On those occasions when rainwater entered the quarry pit, such water was pumped out to a small silting pond constructed on the quarry premises and used for, amongst others, dust suppression and cleaning purposes.

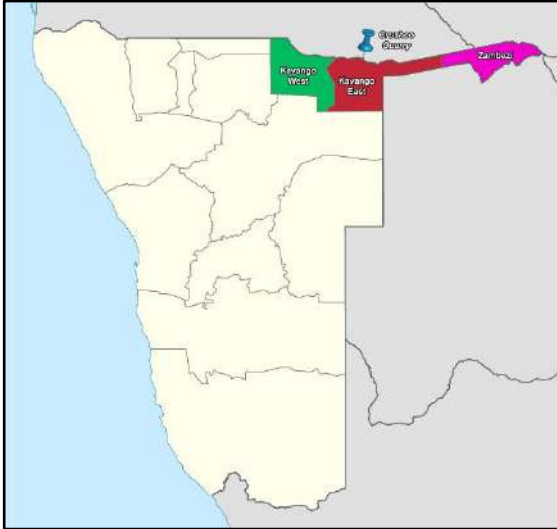


Figure 1: Quarry Location – Regional Context



Figure 2: Quarry Location – Village Context

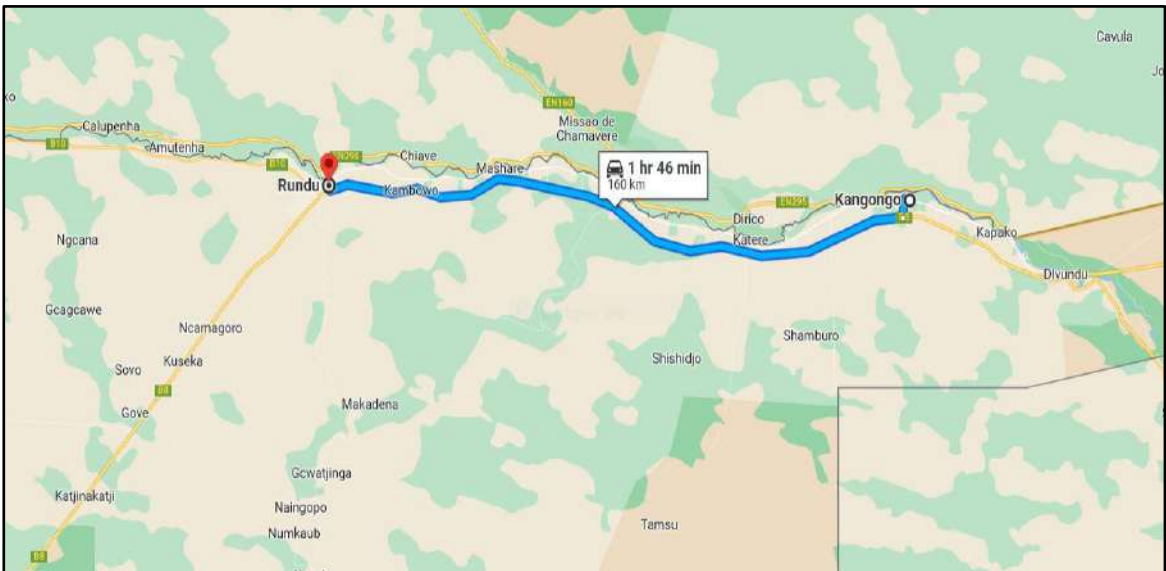


Figure 3: Quarry Location in Relation to Rundu

1.3 Quarry Pit Flooded

The quarry is ± 800 m from the river and water for household is sourced from there using a 6 000 liter water bowser. A Water Abstraction Permit (WAP #11477) was granted by the Ministry of Agriculture, Water and Land Reform (MAWLR) for this purpose and has an annual maximum extraction limit of 288 m³. The permit is attached hereto as **Annexure 1**. During the 2019-2020 rainy season, about 1 100 mm of rainfall was recorded at the quarry site which was more than double the average annual rainfall.

For the first time in the long history of the quarry, the volume of the water in the pit exceeded the storage capacity of the onsite silting pond. It became critical for Crushco to dewater the pit and a formal request was made to MAWLR, for WAP #11477 to be amended to allow for the dewatering. The intention of Crushco was to dewater the pit by pumping the water to the river, using a flexi hose pipe laid out on the land surface.

1.4 Evaporation Pond

To grant the required dewatering permit, Crushco was asked by MAWLR to submit test results from the pit water. Tests were done, however, the quality of the water was classified as Category D and therefore unfit to be discharged directly into the river. The test results are attached to this report as **Annexure 2**. MAWLR would only grant a dewatering permit to pump the water to an onsite constructed Evaporation Pond and that an EIA for the activity should be conducted. The letter from MAWLR is attached hereto as **Annexure 3**.



Figure 4: Quarry Pit Water Level – Feb 2020

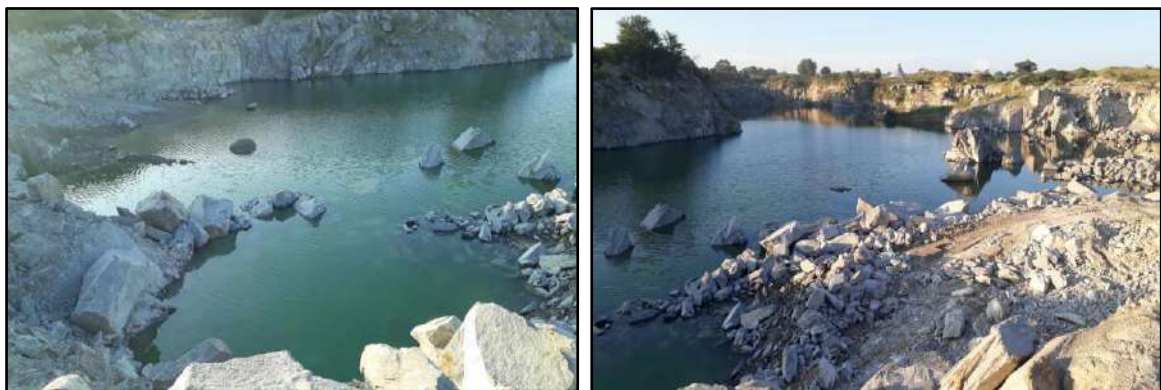


Figure 5: Quarry Pit Water Level – Jun 2020

2. FORMAT OF THE EIA

The EIA has been prepared in two parts, titled as **Part 1 of 2** and **Part 2 of 2**. Part 1 of 2 consists of the scoping Environmental Assessment (EA) report while Part 2 of 2 consists of the Environmental Management Plan (EMP).

Both reports have been attached as **Appendix B** to the amended and updated EMP prepared for the renewal of the ECC. This report is Part 1 of 2 and is the collation of the results of the EIA conducted to evaluate the possible environmental effects that are likely to arise from the construction and operation of an EP for dewatering of the quarry pit. The following aspects have been considered in the EIA:

- ✓ Applicable Regulations & Policies
- ✓ A detail site description including estimated water volumes.
- ✓ Baseline environmental conditions against which changes can be assessed.
- ✓ Description of the proposed EP

- ✓ Consideration for alternatives
- ✓ Identification of potential environmental impacts arising from the proposed EP
- ✓ Impact Assessments Methodology
- ✓ Impact Mitigation Measures

Finally, a detailed evaluation of the impacts of the development is presented to the decision makers, i.e. to MEFT to guide the office of EC in deciding whether to renew the ECC and to MAWLR to guide the ED in deciding whether to grant a Dewatering Permit to the proponent.

3. SITE DESCRIPTION

The aggregate quarry is located at Kangongo - a small village sandwiched between the southern bank of the Kavango River and the B8 tar road - TransCaprivi Highway, in the Mukwe Electoral Constituency of KER. The village is about 160 km from Rundu (**Fig. 3**) and has a population of approximately 4 000 (*Census of 2011*).

The quarry site itself is along the old Rundu-Divundu gravel road and about 800 m from the river (**Figures: 1 & 2**). The GPS coordinates are 17° 56' 49.0" Latitude and 21° 09' 43.1" Longitude. Access from the quarry to the B8 highway is provided by a well maintained gravel road of about 4 km.

As mentioned earlier, the quarry has been in existence for over forty years and boasts a substantial aggregate processing plant complimented by a fleet of earthmoving machinery, delivery trucks, a machine repair workshop, a full scale weighbridge and ancillary facilities.

There are traditional homesteads in the area, but there were no homesteads or amenities observed within a radius of 700 m to the north, east and west of the quarry. The 'heart' of the village is south of the quarry about 800 m away. Public amenities such as the clinic and the local primary school are situated there. Most of the homesteads at the village were constructed after the quarry was already established.

Vast tracks of land to the east, north and west of the quarry site have been cleared of vegetation and were probable cultivated in the past. Judging from vegetation regrowth the land has been lying furrow for a number of years.

3.1 Aggregate Reserve

The confirmed dolomitic quartzite rock reserve which is quarried into aggregates is 1.3 million tons and is deposited on land measuring about 52 ha. However, the current extraction quarry is confined on land measuring about 8.75 ha (350 m long by 250 m wide). At present, the quarry floor is at a depth of 15 m from the land surface. No underground water ingress into the quarry pit has been observed over the years. At the annual extraction rate of 40 000 tons, the quarry should have a life span in excess of 30 years. The inferred resource is however big.

3.2 Estimated Water in the Pit

The quarry has a surface area of 87 500 m² (350 m long by 250 m wide) and a floor depth of 15 m when measured from the land surface. Overburden thickness varies between 1.5 to 4 m. Taking the 1100 mm of rainfall received during the 2019-2020 rainy season, and assuming that 40% of the 1 100 mm rainfall entered the pit as surface run-off, then ±134 750 m³ of water could have collected in the quarry pit. Ideally, the dewatering pond should be developed to accommodate 25% more of this volume, i.e. 168 000 m³.



Figure 6: Proposed EP Site

4. APPLICABLE REGULATIONS & POLICIES

To protect the environment and achieve sustainable development, all projects, programs and policies deemed to have adverse impacts on the environment would require an EIA according to the Namibian legislation. The legislations which govern the EIA process in Namibia, pertaining to the proposed activity are listed and elaborated upon in the next two tables.

Table 1: Regulations

Instrument	Expansion
Namibia Constitution	Article 95 of Namibia's constitution provides that: "The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following: Management of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future; in particular, the Government shall ensure that the natural resources and features like rivers, plants, trees as well as water resources are protected and sustained by providing measures against destroying the environment and the natural resources. This article recommends that a relatively high level of environmental protection is called for in respect of activities which might impact on these natural resources. Article 144 of the Namibian Constitution deals with environmental law and it states.
Environmental Management Act (Act No. 7 of 2007)	Environmental Impact Assessments are regulated by MET in terms of the Environmental Management Act, (Act No. 7 of 2007). This Act was gazetted in December 2007 (Government Gazette No. 3966) and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated in February 2012.
Traditional Authority, Act No. 25 of 2000	The Act provides for the establishment of Traditional Authorities, the designation, election and recognition of traditional leaders including their powers, duties, functions and authorities.
Communal Land Reform Act, Act No. 5 of 2002	The Act provides for the allocation of land rights in the communal areas of Namibia including the establishment, roles and functions of Communal Land Boards. It also provides for the powers of the Chiefs and Traditional Authorities in all matters related to communal land.
Water Resource Management Act, Act No. 11 of 2013	The line ministry is the Ministry of Agriculture, Water and Forestry. This Act provides for the management, protection, development, use and conservation of water resources; to provide for the regulation and monitoring of water services and to provide for incidental matters.
Road Fund Administration Act, Act No. 18 of 1999	Regulates traffic and use of public roads in Namibia including aspects related to road safety, vehicle licensing, roadworthiness, Mass Distance Charges, abnormal loads, etc.
Atmospheric Pollution Act, Act No. 54 of 1965	This Act was enacted in 1965 is still being applied in independent Namibia today and resorts under the Ministry of Health and Social Services. The Act attempts to guard against the pollution of the atmosphere. A number of sections of this Act relate to 'Air Pollution Control Certification', dust control, etc. At present, the Ministry does not grant any certificates as no procedures or guidelines exist. The best practice would be to notify the Ministry of the anticipated emissions.
Atomic Energy and Radiation Protection Act, Act No. 5 of 2005	The Hazardous Substance Ordinance No. 14 of 1974 was repealed and amended by the Atomic Energy and Radiation Protection Act. The Act provides for the control of substances which may cause injury or ill-health or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature. Whilst the environmental aspects are not really explicitly stated, the Act provides guidelines with respect to importing, handling and storage, etc. of hazardous substances. The line ministry is the Ministry of Police, Safety and Security (the Drag Law Enforcement Unit).
Regional Council Act, Act No. 23 of 1992	The Act resorts under the Ministry of Urban and Rural Development and was enacted to promote the planning and coordination of policies at the regional level. Under Article 28, the powers, duties, functions, rights and obligations of regional councils include overseeing the general implementation of regional development activities.
Petroleum Products & Energy Act, Act 13 of 1990	The Act makes provision for the procurement, handling and storage of petroleum products. The line ministry is the Ministry of Mines and Energy.

Table 2: Policies & Agencies

Policy/Agency	Expansion
The Environmental Policy of Namibia	The Environmental Assessment Policy requires that all projects initiated by both the government and private sector that have a detrimental effect on the environment must be accompanied by an EIA. It further provides a guideline list of all activities that require an impact assessment. The proposed activity is listed as an operation requiring an impact assessment.
Vision 2030 and National Development Plans (NDPs)	Vision 2030 states that: "The nation shall develop its natural capital for the benefit of its social, economic and ecological well-being by adopting strategies that: promote the sustainable, equitable and efficient use of natural resources; maximize Namibia's comparative advantages; and reduce all inappropriate use of resources. However, natural resources alone cannot sustain Namibia's long-term development, and the nation must diversify its economy and livelihood strategies.
The Harambee Prosperity Plan (HPP)	The HPP was launched by President Geingob in March 2015 as a targeted Action Plan to accelerate development in key defined priority areas, which lay the basis for attaining prosperity for all in Namibia. The Plan does not replace, but complements the long-term goal of the National Development Plans [NDPs] and Vision 2030. HPP introduces 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.
Cradle to Grave Responsibility	This principle provides that those who handle or manufacture potentially harmful products must be liable for their safe production, use and disposal and that those who initiate potentially polluting activities must be liable for their commissioning, operation and decommissioning.
The Precautionary Principle	It provides that if there is any doubt about the effects of a potentially polluting activity, a cautious approach must be adopted.
The Polluter Pays Principle	A person who generates waste or causes pollution must, in theory, pay the full costs of its treatment or of the harm, which it causes to the environment.
The Public Consultation Process and Access to Information	In the context of environmental management, citizens must have access to information and the right to participate in decisions making.

5. BASELINE ENVIRONMENT

In this section of the EIA, a brief description of the receiving environment is described. The bulk of the information was sourced from several studies done for the green scheme projects in the KER. In fact, three sizable irrigation projects – the 400 ha Shodikongoro, the 40 ha Bagani Garden and 116 ha Divundu Prisons are within the same constituency as the quarry site.

The receiving environment has been assessed in terms of the following:

- ✓ Soil and Site Topography
- ✓ Climatic Conditions
- ✓ Land Use and Tenure
- ✓ Geological Conditions
- ✓ Hydrology (Surface & Underground Water)
- ✓ Biodiversity (Flora and Fauna)
- ✓ Air Quality (Dust & Noise and Vibrations)
- ✓ Heritage and Cultural Aspects
- ✓ Visual Impacts

5.1 Soil and Site Topography

The topography at the site is quite flat without any undulating surfaces, but with a gentle gradient to the north – the river side. Minor rock outcrops were observed to the NW and NE of the quarry. To the NW, West and NE large tracks of land has been cleared of vegetation, but there was no evidence of any recent cultivation observed.

The characteristic common in the majority of soil types can be described as sandy with low clay content and well drained with a high infiltration rate. Unless mixed with some composite or some type of organic matter, the ability of the soil to retain water is low. In a number of tests performed for the irrigation projects in the region, the water retention capability of the soil was at 30 mm, which, in the context of irrigation, was just enough water for up to three days especially during the peak demand periods.

In the context of the quarry pit dewatering, the poor ability of the soil to hold water is a distinct advantage, because discharging such water into the natural environment would not result in any standing water and or clogging up of the soil. On the hand, the nature of the soil also makes monitoring of released water fairly easy.

5.2 Climatic Conditions

On average, the KER has a mean annual rainfall of 320 - 600 mm with most precipitation occurring from November through to March. The lowest recorded rainfall in a season was 170 mm while the highest was 1 038 mm.

Daily maximum temperatures range between 38 C⁰ and 28 C⁰ while night minimum temperatures range between 8 C⁰ and 20 C⁰.

The predominant wind direction at the quarry site is from east to west and strong gust are occasionally encountered. During the summer months, wind is known to blow more intense while calmer conditions are known to prevail during spring or autumn.

In the KER, the average evaporation rate has been estimated at 2 500 mm which is 100 mm below the national evaporation average of 2 600 mm reported by Namwater. In the context of this project, high evaporation rate can be beneficial as all water dewatered from the pit can be effectively evaporated from a well-constructed open storage pond, given ideal conditions such as air temperature, depth of the water in the evaporation pond, wind direction and prevailing humidity.

5.3 Land Use and Tenure

The predominant land use around the quarry site is crop cultivation (mostly mahangu and maize) and livestock rearing (predominantly cattle, goats and sheep) on a subsistence basis. Vast track of land around the quarry has been de-bushed for cultivation, but the land has been lying fallow for many years now without any production taking place.

In terms of the Communal Land Reform Act (CLR), the Kangongo village falls under the jurisdiction of Hambakushu Traditional Authority (HTA). It should be noted that the quarry has been in existence for over forty years, way before the enactment of the CLR and has access to land measuring about 54 ha.

5.4 Geological Conditions

The site has an interesting geology. The dolomitic quartzite rock being quarried at the site is of the Nosib Formation. Geologically, the Nosib Formation is formed about 900 years ago and is considered to represent the lowest stratigraphic unit of the Damara Supergroup. With few exceptions, the Nosib quartzite does not naturally outcrop outside of the Okavango River, and is generally covered by sandy and calcrete sediments of the Kalahari Formation.

At this specific site, the Nosib quartzite is encountered at relatively shallow depths and over a large area. This rather interesting discovery was confirmed via satellite imagery, which indicated that, where the quartzite exists within a few meters below the earth surface, the ground had a peculiar 'speckled' appearance. The reason for this identification was that, where the quartzite rock occurred above the ground water table, termites have carried fragments of the weathered rock to the surface leaving the indicative 'white specs' seen on several terminate hills in the area.

Typically, the Nosib rocks would consist of orthoquartzite with conglomerate horizons and have been deposited in a fluviate/delta environment. The main rock constituent is quartzite while fuchsite (clay mineral), hematite and feldspar are minor constituents. Through pressure (metamorphism) and high temperatures, the mineral components were re-crystallized resulting in individual quartz grains becoming dense and compact structures with little porosity. The result was a strong rock hardly affected by weathering and therefore suitable for commercial applications.

5.5 Hydrology (Surface and Groundwater)

5.5.1 SURFACE WATER

The river which is to the north of the site and about 800 m away is the only permanent open surface water source in the area. There were no surface watercourses observed in the immediate vicinity of the site which demonstrates that rainwater is readily absorbed into the soil rather than taking up overland (surface water) flow paths.

5.5.2 GROUNDWATER

There are no known boreholes around the site and the information provided in this section is based on recent work done for Reconnaissance Energy Namibia (REN) in the KER for its oil exploration activities

which are widely published in the local print media (*Ashley Julius, et. 2021*). In most parts of the KER, groundwater level was quite shallow and encountered at depths of less than 40 m. For locations closer to the river, groundwater level is often less than 15 m deep.

The water quality is largely determined on the amount of Total Dissolved Solids (TDS) with water having TDS of between 400 and 745 ppm considered category A. Water from a number of boreholes drilled in KER for the REN were analyzed and about 90% had TDS of between 500 and 1000 ppm and therefore considered as good quality water, meeting the requirements for Category B. Boreholes drilled within a radius of 5 km of the river were found to have good quality water, but it was also possible to find water with poor quality from boreholes drilled in the same zone. In fact, borehole water of poor quality was more prevalent from boreholes in zones where shallow bedrock occurs.

5.6 Biodiversity

Given that the Kavango River is the source of water supply, humans have settled around the river for hundreds of the years and their activities such as the establishing of settlements, villages, construction of traditional homesteads (using predominantly timber materials, reeds and thatch grass) and chopping down trees for firewood are still practiced to this day and have contributed to considerable land degradation. Such practices are still practiced today although to a less degree than 40 years ago.

5.7 Faunal Diversity:

With the Kavango River as a source of permanent water supply, different species of wildlife (elephants, giraffe, lions, spotted hyena, African wild dogs, etc.) are encountered in both regions of the East and West Kavango. Countless species of birds are also found in habitats along the river.

Over the years, hippos and crocodiles have maimed, wounded and killed scores of people who are often attacked when fetching water from the river or their canoes overturned when crossing the river. Such attacks are still happening in modern times.

5.8 Floral Diversity

The Kavango based rural community does not only use the land for cropping, but it is highly dependent on vegetation resources for their livelihoods. Livestock is grazed on vegetation, timber and thatch-grass are harvested for construction purposes and numerous other resources are used from the wild. (*Geldenhuis, 1996*).

According to a study done for the World Wildlife Fund (WWF), the Kavango would fall within the Zambesian *Baikiaea* woodlands ecoregion (Vetter, 2001a) and is dominated by open woodlands with several hardwood species which include *Baikiaea plurijuga*, *Pterocarpus angolensis* and *Guibourtia Coleosperma*. The *Baikiaea plurijuga* is a species which enjoys special protection. It is fire-sensitive and used extensively for timber and was becoming rather rare. (Giess 1998).

In recent years, there has been a surge in illegal timber harvesting in the KER with huge volumes exported without adding any values and therefore little benefits to the communities and the nation at large.

The project site has been cleared of vegetation and the dewatering activity is not expected to impact negatively on the floral diversity of the village.

6. DESCRIPTION OF THE ACTIVITY

The problem as described above is to dewater the quarry pit operated by Crushco by constructing one big Evaporation Pond or several small Evaporation Ponds into which the water from the quarry can be pumped into. The volume of the water in the pit has been estimated at 168 000 m³. A waste case scenario has been assumed that there is more water in the quarry pit.

6.1 Assumptions

The following assumptions have been made:

- ✓ The quarry pit has not intercepted the water table yet. This is the position of Crushco Management and is premised on historical experience in that, during those 'normal' annual rainfall periods, the company has been able to pump the pit completely dry, without observing any inflow from the pit floor.
- ✓ The origin of the water in the pit comes from two sources. The first source is rainfall, falling directly into the open pit which has a surface area of 78 500 m² (8.75 ha). The second source is storm water or surface run-off which has been assumed at 40% of the heaviest rainfall received during the 2019-2020 rainy season.
- ✓ There are no boreholes drilled around the quarry site to determine the depth or level of the groundwater. The quarry floor is currently at 15 m from the natural ground level and no noticeable ingress from groundwater has been observed over the years.
- ✓ According to the website of Namwater, the evaporation rate in Namibia ranges from 2600 mm in the NE to 3 700 mm in central southern areas. It reaches a peak between the months of October and December with dams losing between 20% and 85% of the water contents during this period. In some studies done for the green schemes, a figure of 2500 mm has been used.
- ✓ One of the key parameters of the envisaged Evaporation Pond design is to prevent the potential interface with groundwater in order to minimise pollution risk and also to avoid the additional capital involved in the procurement of strong pumps to deal with groundwater dewatering. For this reason, the lowest level of the quarry workings will have to be established at least five meters above the groundwater table.

6.2 Consideration for Options

The challenge remains to find ways of disposing the huge volumes of water in the quarry pit which could escalate if further drilling by Crushco intercepts the water table. Should the quarry fail to control and pump the water below the working benches there is a serious risk of losing the quarry.

The following **six** water disposal options have been individually considered and evaluated from the environmental, technical and economical perspectives:

- ✓ The 'no dewatering' option
- ✓ Find an alternative quarry site
- ✓ Pump the water to the river
- ✓ Use the water for irrigation
- ✓ Pump the water into a constructed pond

- ✓ Release the water into the natural environment

6.2.1 THE 'NO DEWATERING OPTION'

The 'no dewatering option' is the option not to undertake the dewatering of the quarry pit. It means that the status quo should remain. The 'no pumping option' would result in no impact on the local environment from quarrying, but there would be a number of significant impacts both economic and environmental.

Without dewatering, Crushco would be forced to cease its quarrying operation altogether, because the bulk of the rock reserves is entirely submerged. There would be a number of job losses and the considerable level of financial contribution which the company makes within the local and regional economies would be reduced or completely stopped.

The closure of the quarry would be felt by the construction companies both big and small including individual builders in the regions of Zambezi and Kavango West and East who are solely reliant on Crushco for the supply of basic primary construction materials. There would be huge demand for aggregate and related building materials which are so vital to the economic development of the said regions. Sourcing such products from Tsumeb and Grootfontein would not be cheap given the distances involved.

By not working the quarry at Kangongo, a valuable resource of good quality aggregate would be sterilized and would not be available to meet the demands for future construction materials necessary to maintain and develop the built environment in the three regions.

Finally, the no dewatering' option is also inconsistent with the national developmental plans of government those of creating employment, poverty reduction and contribution to the national economy through payment of taxes, social security and other levies.

6.2.2 FIND AN ALTERNATIVE QUARRY SITE

The consideration of finding an alternative quarry is limited because, geographically, dolomite or dolerite rocks from which aggregate is quarried can only be worked where they occur. In identifying potential new sites with rock deposits suitable for quarrying aggregates, consideration has still to be given to the likely impacts such potential sites would have on the environment. It should be kept in mind that no site would be completely without impacts and therefore the objective is to identify alternative sites which are likely to result in the least impacts.

The Kangongo based quarry is a brownfield operation which has been in existence for over forty (40) years and the impacts associated with the establishment of required infrastructure and of operating a quarry have been endured already.

The ECC for aggregate has been granted and is being renewed. Furthermore, Crushco has complied with the provisions contained in the EMP and all other legislatives, i.e. water abstraction permits, etc. To find a new quarry elsewhere is a huge challenge which starts with exploration work and there is no guarantee that a site with suitable rock for aggregate production and within close proximity to end users and good roads would be found.

Starting a Greenfield quarry would also come with its own set of environmental challenges without any guarantee that an ECC would be obtained.

6.2.3 PUMP THE WATER TO THE RIVER

This option has been rejected by the line ministry because the water was classified as Category D and is not discussed any further. It was however, unfortunate that Crushco did not take water samples from the river at the same time so as to have such water tested and the results compared to the water in the quarry pit.

As explained in the geology section, the dolomite rock which is quarried for aggregates is covered by a layer of sand with a thickness varying between 1.5 and 3.5 m. Most of the rainwater is therefore absorbed into the soil with no significant surface run-off. There were no natural water channels observed in the vicinity of the quarry into which such water could be released.

6.2.4 USE THE WATER FOR IRRIGATION PURPOSES

There are good reasons to support this option.

Numerous irrigation projects have been developed along the Kavango River, and operated by:

- ✓ Private individuals and/or companies (CCs' or limited liability companies),
- ✓ The public sector (green schemes), and
- ✓ Cooperatives formed by community members.

For a number of reasons, the green schemes operated by government along the river are struggling and, according to media reports, most of them are on the brink of complete collapse. However, those green schemes that are operated by private individuals and Cooperatives are performing fairly well and thriving.

As a country, we are still importing cash crops worth millions of Namibia dollars each year. Such produce can be grown at home creating employment and improving the living conditions of the locals. In most cases, knowledge and skills required to cultivate such crops is readily available.

WATER REQUIREMENT: Most literature have listed the irrigation water requirement in KER as between 12 and 15 m³ per hectare per year depending on aspects such as soil texture, characteristics, pH levels, type of crop cultivated. With the water available in the quarry pit (168 000 m³), an area of up to 10 ha can be cultivated. If this option is implemented, it is advisable that a permit to tap water from the river be secured in order to supplement the quarry water, and ideally, to target a cultivation area of 50 ha developed in phases, which is a more commercial unit than a 10 ha. Such a project could provide a comfortable standard of living to up to twenty people employed on a fulltime basis with several more hired during harvesting.

LAND PREPARATION: De-bushing is one major cost aspect in the preparation of land for cultivation. In the case of this site, vast tracks of land have been cleared already. All that is required is to conduct soil sampling, land preparation, perhaps fencing and related infrastructure pipes, pumps, etc.

IRRIGATION SYSTEMS: There are many irrigation systems developed over the years, but there is no such thing as a best system or method for all soils, field sizes and crop type. The best irrigation system is the one which can adequately irrigate the field, without wasting water, simple to operate, reliable and, preferably with a local backup service provider. It is also important that the irrigation system can be operated without any adverse impact to the environment.

Aggregate quarrying and cash crop cultivation are diverse business enterprises and expecting Crushco to venture into crop production is perhaps unfair and beyond its sphere of interest and technical capabilities. Such a project could be an ideal for the villagers of Kangongo. All that is required is to organize the villagers into a cooperative for them to take up the opportunity collectively.

6.2.5 PUMP WATER INTO AN EVAPORATION POND

This is the option proposed by the MWALR to dewater the quarry pit. The effectiveness of an evaporation pond is influenced by a number of parameters which have to be taken into account, both during the design and construction stages. Some of these factors are:

- ✓ Pond surface area,
- ✓ Pond depth (or water depth in the pond),
- ✓ Evaporation rate,
- ✓ Annual Rainfall,
- ✓ Water inflow and outflow,
- ✓ Orientation of the pond in relation to wind direction, and
- ✓ Turbidity and bottom reflectance.

Evaporation rate in the region has been estimated at approximately 2500 mm per annum which is slightly lower than the national average of 2600 mm established by Namwater. By taking the highest rainfall of 1100 mm – the first highest rainfall recorded in over a decade, the recharge potential of the pond is about 50% of the evaporation rate. The benefit of the high evaporation rate is that an evaporation pond with a smaller footprint can be developed.

If the volume of the water in the quarry pit is taken as 168 000 m³ and 1.2 m as the pond depth, then an evaporation pond with a surface area of 70 000 m² at the evaporation rate 2 500 mm, will be required. The pond can be sited at the northeast corner of the quarry pit where the overburden of up to 4 m thick occurs and there are few rock outcrops.

It should be pointed out here that the design of the evaporation pond is beyond the scope of this EIA report. However, the following recommendations are made from an environmental perspective:

Construct a minimum of two Evaporation Ponds to allow for ease of maintenance and silt removal.

Seal the floor of the ponds to minimise filtration and contamination of underlying soils and groundwater, (clay materials or any suitable local materials can be used for this purpose).

Enhance evaporation by orientating the pond to take maximum advantage from the prevailing wind direction.

Allow maximum flexibility in the pond operation, monitoring and any future potential use of the water for irrigation as well as decommissioning.

There are several ways (i.e. solar heating) to accelerate evaporation which would require a smaller surface area, however, the procurement and maintenance costs involved for mechanical systems will have to be compared to construction costs for a pond with a big surface area.

Release the Water in the Natural Environment

To release the water into the natural environment is another option available to Crushco and is briefly discussed here. The factors which have to be considered with this option are:

- ✓ The nature of the soil into which the water is released.
- ✓ Seepage into the ground.
- ✓ Possible flowrate.
- ✓ Depth of the groundwater.

7. POTENTIAL IMPACTS FROM THE ACTIVITY

7.1 Impact Identification

The environmental impacts associated with the construction and operation of an evaporation pond were identified through the following ways:

- ✓ Desk studies
- ✓ Site visit
- ✓ Discussing with Crushco Management

Reports on EIA studies conducted for a number of projects in the same regions were also consulted to enhance a wider and broader understanding and appreciation of the natural environment in which the project is sited.

7.2 Potential Environmental Impacts

Listed in Table below are environmental impacts that are likely to be triggered by the activity over its the three phases:

Table 3: Potential Environmental Impacts

Environmental Aspect	Construction Phase	Operational Phase	Decommissioning Phase
Land Resource	✓		
• Land Disturbances (excavations)	✓	✓	
• Soil erosion			
Water Resources			
• Contamination of groundwater	✓	✓	✓
• Contamination of surface water	✓	✓	✓
• Floods and rainwater	✓	✓	
Air Quality			
• Dust impacts	✓		✓
• Noise and Vibrations	✓		✓
Waste			
• Solid	✓	✓	✓
• Hazardous	✓		✓
Health & Safety			
• Accidents/ Risk	✓	✓	✓
• Emergency Plan		✓	
Biodiversity			
• Flora	✓	✓	✓
• Fauna	✓	✓	✓
Visual impacts		✓	
Heritage & Cultural impacts	✓		

7.3 Impact Assessment Criteria

The potential impact in the preceding table have been assessed using the criteria listed in Table below.

Table 4: Assessment Methodology

Assessment of Criteria	Description
Status of the Impact	Positive - A benefit on the environment Neutral - No impact on the environment Negative - a cost to the environment
Duration of the Impact	Short term - less than 2 years (score : 2) Medium term - 3 to 5 years (score : 3) Long term - 5 to 10 years (score: 4) Permanent - 10 years and longer (score : 5)
Extent of the Impact	Site Specific - within the quarry premises (score : 1) Local - Affects immediate surrounds (Kangongo village) (score: 2) Constituency - extends beyond Kangongo village (score: 3) Regional - Kavango East Region (score :4) National - country wide (score 5)
Reversibility of the Impact	Completely Revisable - reverses with minimal rehabilitation (score: 1) Reversible - requires rehabilitation and mitigation to reverse (score: 3) Irreversible - completely deformed, cannot be rehabilitated (score: 5)
The Affect (Severity or Beneficiary) of the Impact	Slight - little effect or negligible disturbance (score: 1) Slight to Moderate - effect observable, impacts reversible with time (score: 2) Moderate - effect observable, impacts reversible with rehabilitation (score 3) Moderate to High - Extensive effects, impacts irreversible (score : 4) High - Extensive permanent effects with irreversible alterations (score: 5)
The Probability of the Impact Occurring	Likely : ≤15% of impact occurring (score 1) Possible : ≥15% ≤ 40% sure of impact occurring (score :2) Probable : ≥40% ≤ 60% sure of impact occurring (score: 3) Highly Probable : ≥60% ≤ 85% sure that impact will occur (score: 4) Definite : ≤ 85% sure that an impact will occur (score :5)
The Significance Rating	The Consequence = Duration + Extent + Reversibility + Severity The Significance Rating (S) = Consequence x Probability S ≤ 25 – LOW Impact The impact will not have a direct influence on the decision to the development S ≥ 25 ≤ 50 – Medium Impact The impact will influence the decision to the development unless it is effectively mitigated S ≥ 50 – High Impact The impact will have an influence on the decision process to the development irrespective of the mitigation measures proposed

8. IMPACT ASSESSMENT AND MITIGATIONS

In the section below, all possible impacts associated with the proposed evaporation pond is assessed and mitigation measures proposed.

8.1 Land Resources

8.1.1 LAND DISTURBANCES

Construction of the evaporation pond will involve some form of land disturbances involving mostly the topsoil which supports the root system of vegetation and provides habitats to micro-organisms. The nature of the impact is negative, the duration is of a long term but the extent is localised.

The significance rating is high without mitigation, but medium with mitigation and is fully reversible. The impact is only expected during the construction and decommissioning phases.

8.1.2 TOPOGRAPHY AND DRAINAGE:

The site has a gentle gradient towards the north and the topography will therefore be altered during the pond construction. There were no visible drainage pattern observed and therefore the pond construction is not expected to alter any natural drainage on the site. Depending on the final pond size selected, the significant rate is medium without mitigation and low with mitigation. The impact is of a long duration but is fully reversible with mitigation.

8.1.3 SOIL EROSION:

Dry soils are more susceptible to erosion, both by wind and water. Surface disposal may be able to reduce the erosion slightly. A poorly constructed pond is likely to suffer soil erosion during heavy downpours. The significant rating is medium with mitigation and low without mitigation.

8.2 Impact on Water Resources:

8.2.1 CONTAMINATION OF GROUNDWATER

It is important that the entire floor of the evaporation pond is sealed off with good sealing materials such as clay or gypsum. Poorly sealed floor would allow the wastewater to seep through to the soil and could contaminate groundwater. Without mitigation, the significant rate will be medium and low with mitigation. The impact is likely to occur during the operational phase.

8.2.2 IMPACT ON SURFACE WATER

A poorly constructed pond which allows the wastewater to escape from the pond through the walls or to drain over the shoulders after a heavy downpour will cause such water to mix with the surface run-off. This will defeat the purpose of the building an evaporation pond.

The significant rating is medium without mitigation, and low with mitigation.

8.3 Impact on Air Quality

With respect to impacts on air quality, the aspects which have considered are dust, noise and vibrations. The sensitive receptors are as indicated in Table below:

8.3.1 DUST

Excavation, handling of construction materials, inert materials, windblown and vehicle movements during the pond building activities will be associated with the release of some dust into the atmosphere. Such

impact is expected to be associated with the construction and decommissioning phases only, but the extent is confined to the construction site and limited to working hours only. The village of Kangongo where the primary school is located is to the south and over 1 000 m away from the site and not in the predominant wind direction.

The significance rating is Medium without mitigation and Low with mitigation. No dust is expected during the operational phase of the evaporation pond.

8.3.2 NOISE AND VIBRATIONS

The operation of equipment and earthmoving machinery (excavators, bulldozers and compactors) involved in the construction of the evaporation pond, is expected to generate dust and vibrations (from floor combating). The nature of the impact is negative, but the extent is localised and exposure limited to working hours only. No noise and vibrations are expected during the operational phase.

Mitigation measures – comply with the EMP.

8.4 Waste Management

8.4.1 SOLID WASTE

The construction of the evaporation pond will be done in-house hence limited solid waste of domestic nature will be expected from employees. Additionally, small quantities of damaged materials, scraps, tools and redundant equipment may also be expected. The significance rating is minor.

8.4.2 HAZARDOUS WASTE

No chemicals will be used in the construction of the evaporation pond. Fuel or oil leak from construction machinery could be the only source of hazardous waste during the construction and decommissioning phases. Preventative maintenance and regular servicing of equipment and machinery is key to preventing fuel and oil related leaks.

8.5 Traffic and Transport

The construction work for the ponds will be done in-house with own machinery and equipment which are already on site. Therefore, no significant impact is expected during the course of the pond construction and operational with respect to traffic and transport.

Vehicle accidents and or incidents can be mitigated through proper training and enforcing discipline amongst the operators to carry out pre-start checks and to comply with speed limit at all times.

The significant rating is low with mitigation.

8.6 Health, Safety & Security

It is imperative that a health and security plan is developed to safeguard the construction and operation of the evaporation ponds. Such a plan will prevent physical harm to the workers, visitors to the construction site, to wildlife from potentially hazardous excavations, infrastructure and movements of with earthmoving equipment and machinery. Neglect to have a plan could lead to accidents which are costly and even loss of property and assets. The significant rating is medium when unmitigated and low with mitigation.

8.7 Impacts on Biodiversity

8.7.1 FLORAL DIVERSITY

Most of the land allocated for aggregate quarrying has been cleared of vegetation but significant regrowth has occurred over the years. There were no trees identified during the baseline assessment, as protected species. Excavation of the pond will, inevitably, result in loss of habitats to living organisms.

The impact is expected to occur during the construction and decommissioning phases only. With mitigation, the significant rating is low but medium without mitigation.

8.7.2 FAUNAL DIVERSITY

The development of evaporation ponds is likely to disturb habitats mostly for reptiles and other living creatures. The impact is likely to occur mostly during the construction phase. Once the ponds have been filled with water, they would naturally become wetlands attracting different bird species where they forage for aquatic invertebrate and insects.

After several years of operations, a great variety of wildlife would have developed around the ponds to such an extent that decommissioning would not be contemplated. The significant rating is medium when the impacts are unmitigated and low when impacts are mitigated.

8.8 Visual and Landscape Impacts

The evaporation pond will be built on the quarry premises behind the existing quarry infrastructure (crushing & screening plants and workshop) and barely visible from the public using the old Rundu-Divundu gravel road.

The external pond walls will be of a low height, built with topsoil, vegetated and therefore blending in well with the natural environment. Visual and landscaping impacts are therefore expected to be of Low significance rating during the construction and operational phase.

During the decommissioning phase, landscaping is the only visual aspect likely to be negatively impacted.

8.9 Heritage & Cultural Impacts

There are known items of heritage or cultural interests on the site identified for the construction ponds. In the event that any such items are found 'a chance find procedure' in the EMP should be followed.

Table 5: Summary of Impacts

POTENTIAL IMPACTS	NATURE OF IMPACT	IMPACT SIGNIFICANCE			
		UNM	MIT	UNM	MIT
		CONSTRUCTION		OPERATIONAL	
UNM = Unmitigated		MIT = Mitigated			
Impacts on Land Resource:					
• Land Disturbances	Negative	Medium	Low	Low	Low
• Topography & Drainage	Negative	Medium	Low	Low	Low
• Soil Erosion	Negative	Low	Low	Low	Low
Impacts on Water Resource:					
• Contamination of groundwater	Negative	Medium	Low	Medium	Low
• Contamination of surface water	Negative	Low	Low	Low	Low
• Flooding and rainfall	Negative	Medium	Low	Medium	Low
Impact on Air Quality					
• Dust	Negative	Medium	Low	Low	Low
• Noise & Vibrations	Negative	Medium	Low	Low	Low
Waste Management					
• Solid	Negative	Medium	Low	Low	Low
• Hazardous	Negative	Low	Low	Low	Low
Health & Safety Impacts					
• Potential for Incidents/Accidents	Negative	Low	Low	Low	Low
• With effective Management Measures	Negative	Low	Low	Low	Low
• Possible drowning	Negative	Low	Low	Medium	Low
Impacts on Biodiversity					
• Flora	Negative	Low	Very Low	Low	Low
• Fauna	Negative	Low	Very	Medium	Low
Visual Intrusion	Negative	Medium	Low	Medium	Low
Impacts on Heritage & Cultural Items	Negative	Low	Very Low	Low	Low

9. CONCLUSION

Proven aggregate resource at the site has been set at about 1.3 million tons of high quality aggregate. For Crushco to access this resource and to meet the aggregate demand for the construction sector in the three regions serviced by the company, a dewatering permit from the MAWLR is a requirement which has to be complied with. MAWLR has ruled that the water from the quarry pit cannot be pumped to the river, but to an EP.

This EIA has demonstrated that the construction of the EP will not have any major environmental effects on the current baseline conditions, if the management measures as outlined in the amended EMP are complied with. The EP will not alter the working at the quarry, the access road, scope of the operation and working hours will remain exactly the same. Also, the land on which the EP will be constructed has been cleared of vegetation already.

In fact, a potential impact from the activity could be turned into a commercial opportunity if the water pumped into the EP is used to develop a small scale irrigation project – producing cash crops on 10 ha. All that is required is for the villagers to organise themselves into a cooperative in order to take up the opportunity. Adequate fertile land is available for such a project, and in case the water from the quarry pit is inadequate, the river is close by.

The continued operation of Crushco at Kangongo would have a number of positive socioeconomic effects including the continuation of employment levels and financial expenditure within the local economy.

10. **ANNEXURES**

Annexure 1 : Water Abstraction Permit

Annexure 2: Water Test Results

Annexure 3: Request for an EIA

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Annexure : 1

Water Abstraction Permit (WA 11477)



REPUBLIC OF NAMIBIA

MINISTRY OF AGRICULTURE, WATER AND FORESTRY

Telephone: (061) 2087220

Fax: (061) 2087227

Enquiries: B.B.Wohler

Reference: 9/3/3/14

Department of Water Affairs

Private Bag 13193

Windhoek

9000

Crushco Trading Cc

P O Box 302

RUNDU

Namibia

Dear Sir

APPLICATION FOR A PERMIT FOR THE ABSTRACTION OF WATER FOR CLEANING OF MINING EQUIPMENT AND FOR DOMESTIC PURPOSES FROM THE OKAVANGO RIVER AT KANGONGO VILLAGE IN THE MUKWE CONSTITUENCY, OKAVANGO REGION

1. The above-mentioned application has been approved. Attached please find permit number 11477 which authorizes the abstraction of water for cleaning of mining equipment and for domestic purposes from the Okavango River.
2. You are kindly requested to comply with all permit conditions, especially conditions number 3 and 4.
3. Kindly take note that this permit implies no exemption from compliance with environmental legislation. Your returns of water abstracted shall be based on actual water meter readings.

EXECUTIVE DIRECTOR

2019-11-08
Republic of Namibia
Minister of Agriculture, Water & Forestry
EXECUTIVE DIRECTOR



REPUBLIC OF NAMIBIA

MINISTRY OF AGRICULTURE, WATER AND FORESTRY

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Private Bag 13193

Enquiries: B.B.Wohler

Windhoek

Reference: 9/3/3/14

9000

PERMIT NUMBER : 11477

DATE: 28 OCTOBER 2019

PERMIT ISSUED IN TERMS OF SECTION 7 (aA) OF THE WATER ACT, 1956 (ACT 54 OF 1956), AS AMENDED AND AS APPLICABLE ON A PUBLIC STREAM

NAME OF PERMIT HOLDER	:	Crushco Trading Cc
ADDRESS	:	P O Box302 Rundu
DETAIL OF LAND	:	Kangongo Village; Mukwe Constituency
BE ABSTRACTED	:	Okavango River
VALIDITY PERIOD	:	3 (Three) years
PURPOSE FOR WHICH WATER MAY BE USED	:	Cleaning of Mining Equipment and Domestic
ABSTRACTION PER YEAR	:	288 m ³ /annum maximum

This permit authorizes the abstraction and use of water for cleaning of mining equipment and domestic purposes from the Okavango River on Kangongo Village in the Mukwe Constituency, subject to the following conditions:

1. The validity period shall be from 01 November to 30 October 2022.
2. An application for the extension of the validity period shall be in the possession of the Executive Director at least 6 (six) months before the expiry date of the permit.
3. All water abstracted shall pass through a water meter and the permit holder shall bear all costs for the supply, installation and maintenance of this meter. The Executive Director shall be informed beforehand if a water meter is to be installed so that an inspection, if necessary, can be conducted. Installation of the meter shall be to the satisfaction of the Executive Director.

4. The permit holder shall keep daily readings in cubic metres of the above-mentioned water meter and enter it quarterly on the prescribed return form WA-003, which shall be submitted on or before the 10th day of the following quarter, in respect of the previous quarter, to the Control Officer: Abstraction Control. If no water was abstracted during a quarter, a nil return form shall be submitted. If the permit holder fails to send in regular returns, it could lead to the withdrawal of the permit.
5. No embankments or structures shall be constructed around the abstraction installations in the river which could result in damming up or impeding the normal flow.
6. All installations, reservoirs, pipes, taps troughs and reticulation systems shall be leak proof to prevent any spillage of water. The permit holder shall take the necessary precautions to use the water on his property to the best advantage.
7. The Executive Director or his authorized representative in consultation with the Minister shall have the right to:
 - (a) withdraw, amend or replace any condition of this permit or withdraw this permit in its entirety, after reasonable notice to the permit holder.
 - (b) inspect the source and installations at all reasonable times to determine whether the permit conditions are adhered to.
8. The Executive Director shall not accept liability for damage or loss suffered by the permit holder should the relevant source wane or run dry or the period of validity of the permit not be extended or renewed.
9. Should the permit holder not comply with any of the permit conditions:
 - (a) the permit holder may be held liable for any costs which the Executive Director may incur as a result thereof, and
 - (b) the permit holder shall be guilty of an offence and shall, on conviction, be liable to the penalties prescribed in Section 170 of the Water Act, 1956 (Act 54 of 1956).


EXECUTIVE DIRECTOR
2019 - 11 - 08
Percy W Miska
EXECUTIVE DIRECTOR
Republic of Namibia
Ministry of Agriculture, Water & Forestry

Annexure : 2

Water Test Report

TEST REPORT

To: **Crushco Trading cc**
P.O. Box 302
Rundu

Date received: **30-Jun-20**
Date analysed: **01 July - 07 July 2020**
Date reported: **13-Jul-20**

Attn: A. Louw
e-mail: crushco.info@gmail.com
Tel: 081-331 3251

Your Reference: QU-4455
Lab Reference: I201006

Sample details	water sample
Location of sampling point	Kangongo
Description of sampling point	quarry water
Date of sampling	2020/06/24
Time of sampling	9:55
Test item number	I201006/1

Parameter	Value	Units	Classification	Recommended maximum limits			Livestock watering
				Group A	Group B	Group C	
p H	7.5		A	6-9	5.5-9.5	4-11	
Electrical Conductivity	959	mS/m	D	150	300	400	
Turbidity	1.0	NTU	A	1	5	10	
Total Dissolved Solids (calc.)	7915	mg/l					6000
P-Alkalinity as CaCO ₃	0	mg/l					
Total Alkalinity as CaCO ₃	278	mg/l					
Total Hardness as CaCO ₃	2322	mg/l	D	300	650	1300	
Ca-Hardness as CaCO ₃	642	mg/l	C	375	500	1000	2500
Mg-Hardness as CaCO ₃	1680	mg/l	D	290	420	840	2057
Chloride as Cl ⁻	1886	mg/l	D	250	600	1200	1500-3000
Fluoride as F ⁻	1.2	mg/l	A	1.5	2.0	3.0	2.0-6.0
Sulphate as SO ₄ ²⁻	3393	mg/l	D	200	600	1200	1000
Nitrate as N	6.8	mg/l	A	10	20	40	100
Nitrite as N	0.08	mg/l					10
Total nitrogen as N	7.2	mg/l					
Total phosphate as P	0.05	mg/l					
Sodium as Na	1767	mg/l	D	100	400	800	2000
Potassium as K	6.3	mg/l	A	200	400	800	
Magnesium as Mg	408	mg/l	D	70	100	200	500
Calcium as Ca	257	mg/l	C	150	200	400	1000
Manganese as Mn	0.01	mg/l	A	0.05	1.0	2.0	10
Iron as Fe	0.01	mg/l	A	0.1	1.0	2.0	10
Stability pH, at 25°C	6.7						
Langelier Index	0.8	scaling		>0=scaling, <0=corrosive, 0=stable			
Ryznar Index	6.0	scaling		<6.5=scaling, >7.5=corrosive, ≥6.5 and ≤7.5=stable			
Corrosivity ratio	22.3	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			

Interpretation based on guidelines for the evaluation of drinking water for human consumption, DWA, Namibia, July 1991



M. Mayer
Section Head: Water Quality

This test report is only valid without any alterations and shall not be published or reproduced except in full, with written consent of the laboratory.

Remark: Overall classification of water, considering only constituents that have been tested for:
Group D, high risk water.

For practical reasons, the guidelines are divided into four groups.

The highest group assigned to any of the constituents determines the classification of the water as a whole.

Group A: excellent quality water

Group B: good quality water

Group C: low risk water

Group D: high risk or water unsuitable for human consumption

Ideally water should be either Group A or Group B. If water is classified as Group C, the situation is not yet critical, but attention should be given to those constituents over the Group B limit. If however, the water is classified as Group D urgent and immediate attention is required to reduce the levels of the problem constituents in the water to suitable levels.

Sample acceptance: Sample was collected in clients' own bottle.
Sample was suitable for testing



M. Mayer
Section Head: Water Quality

Assessment of water quality for human consumption

Naturally occurring chemicals that are of health significance in drinking water

Fluoride: Exposure to high levels of fluoride, which occurs naturally, can lead to mottling of teeth and, in severe cases, crippling skeletal fluorosis.

1.0-1.5 mg/l fluoride: slight mottling of dental enamel may occur in sensitive individuals. No other health effects are expected

Chemicals from agricultural activities that are of health significance in drinking water

Nitrate and nitrite: In water it has been associated with methaemoglobinaemia, especially in bottle-fed infants
6-10 mg/l nitrate as N: rare instances of methaemoglobinaemia in infants; no effects in adults. Concentrations in this range generally well tolerated.

Some of the naturally occurring chemicals which occur in drinking water at concentrations below those at which toxic effects may occur.

Chloride: high concentrations of chloride give a salty taste to water. Concentrations in excess of 250 mg/l are increasingly likely to be detected by taste.

Hardness: Depending on the interaction of other factors, such as, pH and alkalinity, water with a hardness above approximately 200 mg/l may cause scale deposition in the pipe work and tanks. On heating, hard waters form deposits of calcium carbonate scale.

pH: Optimum pH 6.5-8.

pH does not exert direct health effects, but may exert indirect health effects via metal solubility.

Sodium: The average taste threshold for sodium is about 200 mg/l.

Sulphate: It is generally considered that the taste impairment is minimal at levels below 250 mg/l.

Magnesium: The average taste threshold for magnesium is about 70 mg/l

Total dissolved solids: The palatability of water with a TDS level of less than 600 mg/l is generally considered to be good; drinking water becomes significantly and increasingly unpalatable at TDS levels greater than about 1000 mg/l.

Turbidity is a measure of the light-scattering ability of water and is indicative of the concentration of suspended matter in water.

Microorganisms are often associated with turbidity, hence low turbidity minimises the potential for transmission of infectious diseases. Turbidity also affects the aesthetic quality of water.

Turbidity in water is caused by the presence of suspended matter which usually consists of a mixture of inorganic matter, such as clay and soil particles and organic matter.

Turbidity may also be associated with the presence of inorganic ions such as manganese(II) and iron(II).

The consumption of turbid water *per se* does not have any direct health effects, but associated effects due to microbial contamination or the ingestion of substances bound to particulate matter, do.

Aesthetic effects (appearance, taste, odour) of turbidity can be mitigated or removed by decantation or by filtration (or by both), accelerated, if necessary, by previous aeration



M. Mayer
Section Head: Water Quality

Summary of test methods - Water Quality

Determinant	Unit	DL	Technique	Method reference
Absorbed oxygen	mg/l O ₂	1	titrimetric	SANS 5220:2005
Acidity	mg/l CaCO ₃	20	titrimetric	AWWA 2310 B
Alkalinity	mg/l CaCO ₃	20	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 ⁻	0.01	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	1	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	0.02	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		AWWA ICP-3500-Al C
Antimony	mg/l Sb	0.01		AWWA ICP-3500-Sb C
Arsenic	mg/l As	0.01		AWWA ICP-3500-As D
Barium	mg/l Ba	0.01		AWWA ICP-3500-Ba C
Beryllium	mg/l B	0.01		AWWA ICP-3500-Be
Bismuth	mg/l Bi	0.01		AWWA ICP-3500-Bi
Boron	mg/l B	0.01		AWWA ICP-3500-B D

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

Annexure : 3

Letter Requesting an EIA



REPUBLIC OF NAMIBIA

MINISTRY OF AGRICULTURE, WATER AND LAND REFORM

Telephone: (061) 2087228
Fax: (061) 208 7697
Enquiries: J N Mouton
Reference: 9/3/3/14

Department of Water Affairs
Private Bag 13193
WINDHOEK
Namibia

REPUBLIC OF NAMIBIA
MINISTRY OF AGRICULTURE,
WATER AND LAND REFORM

27 APR 2021


Private Bag 13184, Windhoek
Directorate of Water Resource Management

The Manager
Crushso Trading CC
P O Box 302
RUNDU

Dear Sir

APPLICATION FOR A DEWATERING PERMIT FOR THE PUMPING AND DISCHARGING OF WATER FROM THE QUARRY PITS INTO THE OKAVANGO RIVER AT KANGONGO VILLAGE IN THE MUKWE CONSTITUENCY, KAVANGO EAST REGION

1. Your application dated 16 February 2021 in the above-mentioned regard, refers.
2. The application can unfortunately not be approved at this stage and you are advised to do the following:
 - 2.1 Develop bigger pits on site to accommodate the dewatered groundwater from the quarry pit.
 - 2.2 Conduct an Environmental Impact Assessment (EIA).
3. Please take note that a comprehensive technical report on a full-fledged dewatering programme must be submitted upon completion of the study to this Ministry accompanied by the application for dewatering before the issuance of the necessary permit can be considered.


Percy W. Misika
EXECUTIVE DIRECTOR

APPENDIX B

Part 2 of 2

**An Environmental Management Plan (EMP) for
the Construction and Operation of AN
Evaporation Pond for the Purpose of
Dewatering the Quarry Pit**





Prepared for : Crushco Trading CC

PART 2 of 2 :

**Title : Environmental Management Plan
(EMP) for the Construction and
Operation of an Evaporation Pond
for the Purpose of Dewatering the
Quarry Pit**

Date : May 2022

ABBREVIATIONS AND ACRONYMS

Term	Expansion
BAT	Best Available Technology
COVID-19	'CO' - Corona, 'VI'- Virus & 'D' - Disease of 2019
EC	Environmental Commissioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GPS	Global Positioning System
REN	Reconnaissance Energy Namibia
ha	hectare (1 ha = 10 000 m ²)
HPP	The Harambee Prosperity Plan
IAPs	Interested and Affected Parties
KER	Kavango East Region
KWR	Kavango West Region
m ²	square meters
MEFT	Ministry of Environment, Forestry and Tourism
MHSS	Ministry of Health and Social Services
MME	Ministry of Mines and Energy
MAWLR	Ministry of Agriculture, Water and Land Reform
NHC	National Heritage Council
NSI	Namibia Standards Institute
TDS	Total Dissolved Solids
PPE	Personal Protective Equipment
SHE	Safety, Health & Environment
SME	Small and Medium Enterprises
TIPEEG	Targeted Intervention Programme for Economic and Employment Growth
List of Road Numbers	
B8	The route number of the road starting from B1 at Otavi to Katima Mulilo via the towns of Grootfontein, Rundu and Divundu. Today, B8 is known as the Trans-Caprivi Corridor – a vital road providing access to land-locked countries of Zambia, Botswana and DRC to the sea route via the port of Walvis Bay.
C48/D3403	The route number for the road starting from B8 at Divundu to Mohebo Border Post – the border post between Namibia and Botswana

DEFINITIONS

Term	Expansion
Environmental Compliance Inspection	A systematic verification process of objectively obtaining and evaluating evidence to determine whether specified environmental activities, conditions, management systems and or information about these matters conform with the criteria and communicating results of the such process to the client.
Cumulative Impacts	In the context of quarrying, cumulative impacts would mean the impacts of quarrying activities which in themselves may not significant but may become significant when added to the existing and potential impacts resulting from similar or diverse activities or underrating in the area.
Environmental Component/Aspect	An attribute or constituent of the environment (i.e., air quality; marine water; waste management; geology, seismicity, soil, and groundwater; marine ecology; terrestrial ecology, noise, traffic, socio-economic) that may be impacted by the proposed project.
Environmental Impact	A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.
Environmental Management Plan (EMP)	A working document which contains site project specific plan developed to ensure that environmental management practices to eliminate and control environmental impacts are followed during the developmental phases of that site, project and or facility and would normally consist of construction phase, operational phase and decommissioning phases. Commissioning and Operation phases.
Environmental Monitoring	The collection, evaluation and summarization of environmental data by continuous or periodic monitoring of certain qualitative and quantitate indicators characterizing the state of environmental components and their modification as a result of the impact of natural and anthropogenic factors.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have detrimental impact on health and the environment.
Interested and Affected Parties	All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project, including neighbouring landowners & Road Fund Administration.
Non-compliance	Issues that are in direct non-compliance with the requirements, commitments and/or management measures as approved in the EMP.
Overburden	In the context of this quarrying operation, overburden is the soil layer that lies above the dolomitic rock which is extracted for the production of aggregates. The first 400mm layer of the overburden comprises of topsoil which supports the rooting system for vegetation, plants and trees and should be set aside and preserved for future rehabilitation.
Sensitive Area	A sensitive area or environment is described as an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is high potential for ecotourism
Vegetation Rehabilitation	This refers to the re-establishment of indigenous vegetation with a similar species composition to that which naturally occurs in the specific geographical environment.
Waste	Any substance, whether or not that substance can be reduced, re-used or recycled and recovered- <ul style="list-style-type: none"> • that is surplus, unwanted, rejected, discarded, abandoned or disposed of; • which the generator has no further use of and for the purposes of production; • that should be treated or disposed of; • that is identified as waste by the Minister by notice in the Gazette and includes waste generated by the quarrying, mining, medical or other sector, and • any portion of waste, once reused, recycled and recovered, ceases to be waste.
Waste Classification	Establishing whether a waste is hazardous or not based on the nature of its physical, health and environmental hazardous properties (hazard classes); and The degree or severity of the hazard posed (hazard categories).
Waste Management	Classifying, recycling, treatment and disposal of waste generated during construction, operation and decommissioning activities.

TABLE OF CONTENTS

1.	INTRODUCTION	7
1.1	Objectives Of The EMP	7
1.2	Acceptance of EMP	7
2.	ENVIRONMENTAL IMPACTS	7
3.	MITIGATION MEASURES	8
3.1	Land and Soil Disturbances	8
3.1.1	Environmental Objective	8
3.1.2	Management Actions.....	8
3.2	Water Resources	9
3.2.1	Environmental Objective	10
3.2.2	Management Actions.....	10
3.3	Air Quality	11
3.3.1	Environmental Objective	11
3.3.2	Management Actions.....	11
3.4	Waste Handling	12
3.4.1	Environmental Objective	12
3.4.2	Management Actions.....	13
3.5	Health, Safety & Security measures	13
3.5.1	Environmental Objective:	14
3.5.2	Management Measures.....	14
3.6	Biodiversity	15
3.6.1	Environmental Objective	15
3.6.2	Management Actions.....	15
3.7	Archaeological, Heritage and Cultural Aspects.....	17
3.7.1	Environmental Objectives.....	17
3.7.2	Management Actions.....	17
3.8	Visual Disturbances	18
3.8.1	Environmental Objective	18
3.8.2	Management Actions.....	18
4.	PARTIES RESPONSIBLE	18
4.1	The Quarry Manager (QM)	19
4.2	Specific EMP Tasks.....	19
5.	MONITORING	19
5.1	Introduction.....	19
5.2	Monitoring.....	19
5.3	Inspection and Maintenance.....	20

LIST OF TABLES

Table 1: Activities Associated with Impacts ----- 8
Table 2: Management Measures for Impacts on Land & Soil ----- 8
Table 3: Management Measures for Impacts on Water Resources----- 10
Table 4: Management Measures on Impacts on Air Quality ----- 11
Table 5: Management Measures on Waste Handling ----- 13
Table 6: Health, Safety & Security Measures----- 14
Table 7: Management Measures on Impacts on Biodiversity----- 16
Table 8: Management Measures on Potential Impacts on Heritage & Cultural Matters ----- 17
Table 9: Management Measures on Visual Disturbances ----- 18
Table 10: Proposed Inspection and Maintenance Schedule ----- 20

1. INTRODUCTION

This Environmental Management Plan (EMP) has been prepared to serve as a standalone plan for Crushco (the proponent) to manage and to safeguard the environmental impacts associated with the construction, operation and decommissioning of EPs intended for the dewatering of its quarry pit at Kangongo village in the Mukwe Constituency of the Kavango East Region.

1.1 OBJECTIVES OF THE EMP

The underlying objective is to ensure that all possible negative impacts associated with the construction, operation and to some extent the decommissioning are considered and mitigation measures as proposed, are implemented. This will help to ensure that the operation is carried out, in a manner which is technically feasible, socially acceptable and environmentally sustainable.

This EMP is binding on Crushco management, to the staff, to all current and future employees, as well as to any third parties who may be hired to perform certain functions on the EPs from time to time.

1.2 ACCEPTANCE OF EMP

The acceptance of the EMP and the granting of an ECC will confer a legal obligation to Crushco to comply with the recommendations contained in the document. Should the proponent fail to comply with such recommendations, it is deemed a contravention in terms of EMA, and, as such, is criminally prosecutable.

This EMP includes all relevant documentation contained in it, or referred to, within it, along with any amendments, appendices or annexures. Any substantial changes, updates or revisions to the EMP must be submitted to MEFT for the endorsement and approval of the Environmental Commissioner.

2. ENVIRONMENTAL IMPACTS

The first step to understand the environmental effects or impacts that are associated with any development is to have a clear understanding of the biophysical and human environment in which the proposed development, in this case, the Evaporation Pond (EP) will be constructed and operated.

The next step is to identify the environmental aspects that give rise to such impacts. For example topsoil stripping during the construction for the EP is associated with noise generated by the machineries used in the operation (excavator and dump trucks) and dust from handling soil materials which is mostly dry. If the operation is conducted under windy conditions, the dust could be picked up by the wind and spread away over a wider area. Such aspects have the potential to impact the environment in different ways.

Successful management will be measured by how well Crushco minimises, eliminates, mitigates and or avoids such impacts that are likely to arise from the construction and operation of the EP. In Part A, the scoping section of the EIA, the environmental aspects and environmental impacts that are likely to arise from the construction and operation of the EP, have been identified and their significance ratings assessed.

The environmental aspects that are associated with the proposed project and how those can impact the biophysical and human environment are briefly highlighted for the purpose of understanding the mitigation measures recommended in the EMP.

It should be noted that the development of the EP is an auxiliary activity which Crushco has to undertake in order to address the dewatering of its quarry pit. Some of the activities involved and resultant environmental impacts in the construction and operation of an EP as recommended by the MAWLR are as listed in **Table 1** below.

Table 1: Activities Associated with Impacts

Activities	Construction	Operation	Decommissioning
Land clearing	✓		
Topsoil – excavation, loading & hauling	✓		✓
Stockpiling	✓		✓
Grading or levelling	✓		
Compaction – floor and berms	✓		
Sealing of pond floor - with clay or similar materials,	✓		
Stone cladding of internal pond walls	✓		
Vegetation of external pond walls	✓	✓	✓
Rehabilitation	✓	✓	
Water pumping from the quarry pit		✓	

These activities will be conducted in-house prior to pumping the water from the quarry pit.

3. MITIGATION MEASURES

3.1 LAND AND SOIL DISTURBANCES

Clearing land to establish the EP will inevitably involve some form of land disturbances which could lead to an increased risk of soil erosion unless mitigation measures are taken. Reasonable and practical measures are to be taken to minimise short and long term soil erosion and any possible adverse effects of sediment transport.

3.1.1 ENVIRONMENTAL OBJECTIVE

The objective of the management measures is to ensure that limited land disturbances is made and the aesthetic value is maintained. Topsoil stripping, stockpiling and replacement operations should be undertaken in a manner that limits impacts on the soil functionality and to ensure that successful rehabilitation to pre-construction state can be achieved.

3.1.2 MANAGEMENT ACTIONS

The management actions recommended to avoid, minimise or to completely eliminate the impacts associated with land and soil disturbances are detailed in the **Table 2** below.

Table: Measures for Land and Soil Management

Table 2: Management Measures for Impacts on Land & Soil

Aspect or Issues	Management Measures
These measures apply during the Construction & Operation phases. QM is the responsible person.	
Siting of EP	<ul style="list-style-type: none"> The area selected for the establishment of EP should be surveyed, clearly demarcated and marked out with pegs or poles that are clearly visible. The area selected should be adequate to accommodate the volume of water in the quarry pit including any possible future extensions.

Aspect or Issues	Management Measures
These measures apply during the Construction & Operation phases. QM is the responsible person.	
	<ul style="list-style-type: none"> • The site selected for EP should involve the least removal of vegetation and trees. • Unnecessary land disturbances should be avoided by limiting excavations within the confines of the demarcated site. • Excavate to the required depth and berm heights should not exceed 1.5 meters.
Topsoil Handling	<ul style="list-style-type: none"> • Strip topsoil falling with the footprint of the EP down to a depth of approximately 750 mm and stockpile aside. Strip and stockpile the topsoil together with any vegetation cover present. • Use topsoil in the construction of pond berms and ensure that topsoil is stockpiled in close proximity to the area where it will be used so as to avoid multiple handling. • It is recommended to handle soil in dry weather conditions so as to cause little compaction as possible. • Implement measures such as inert rock cladding to prevent erosion of topsoil stockpiles and berm walls. • Stockpiles should be established with stormwater diversion berms in place so as to prevent erosion. • Heights of topsoil stockpiles should be limited to 1.5 m and profiled to a width not exceeding 3 m. • Topsoil not used in the construction of berms should be kept on stockpiles and vegetated. Use topsoil on stockpiles for future maintenance of EP berms. • Equipment and human movements on topsoil stockpiles should be limited so as to avoid topsoil compaction and subsequent damage to the soils and seedbank. • The slopes of the EP must be maintained with proper vegetation in order to prevent erosion or loss of soil. Furthermore, eroded banks will make it difficult to access and maintain the EPs.
Aesthetic & Erosion	Areas temporarily disturbed during the construction of EP any that are not required for the dewatering operations should be identified, graded and rehabilitated to improve aesthetics and reduce erosion.
Monitoring	An erosion monitoring procedure for the EP should be developed whereby any potential erosion sites including visible gullied sections of the pond walls are identified and rectified before the onset of the wet season. Areas of the EP where erosion was remediated previously should also be monitored during the wet season.

3.2 WATER RESOURCES

With the construction and operation of the EP, the possibilities exist to impact water resources, both surface and groundwater. The objective of managing water resources, especially surface run-off water is to provide flow pathways for storm water from several catchment areas around the quarry to be diverted around the EP. Therefore, the design, construction, maintenance and operation of the EP should be to avoid any wastewater contaminating the surface and groundwater resources or the natural environment.

Management measures have to be developed on the understanding that the river is the only known surface waterbody in the surroundings and it is about 800 m from the EP construction site. There is therefore a low risk of contamination of the river from the activities undertaken during all phases of the EP. Also, most of the surface run-off is mostly absorbed into the Kalahari Sands as no sub-surface watercourses were observed on the site.

3.2.1 ENVIRONMENTAL OBJECTIVE

The environmental objective with respect to water resource is to ensure that the construction and operation of the EP are performed in manner that prevents the pollution and contamination of both surface run-off and groundwater.

3.2.2 MANAGEMENT ACTIONS

The management actions recommended to avoid, minimise or to completely eliminate the impacts associated with water resources are detailed in the **Table 3** below.

Table 3: Management Measures for Impacts on Water Resources

Aspect or Issues	Management Measures
These measures apply during the <u>construction and operation</u> phases. QM is the responsible party.	
No mixing of clean and dirty wastewater	<ul style="list-style-type: none"> The EP should be designed, constructed and operated in such a manner that wastewater from the quarry pit is kept separate from clean water run-off at all times. Dewatering of the quarry pit should be done through a non-intrusive method such as pumping such water through a flexi hose pipe. No permanent structure, i.e. channel or trenches should be constructed between the quarry pit and the EP. The EP could be protected against potential floods through a system of berms, channels or low level trenches constructed around its external walls. The slopes of the EP berms could be reinforced by using stone cladding.
Contamination of surface water run-off	<ul style="list-style-type: none"> Prevent pollution of surface water through training of personnel and effective handling, storage and removal of waste both solid and hazardous during the construction and operation of the EP. Construct diversion berms around the EP and quarry premises to prevent wastewater mixing with surface run-off.
Contamination of surface run-off (from spills, leaks, etc.)	<p><u>Sealing of Pond Floors</u></p> <ul style="list-style-type: none"> Seal the EP floor surface with a layer of clay materials to prevent wastewater infiltration to groundwater or to the natural environment. Ensure that all construction work is carried out to specified standards and performed by experienced staff. <p><u>Fuel and Refueling:</u></p> <ul style="list-style-type: none"> No fuel or oil should be stored at the EP construction site. All fuel and oil should be held at the quarry workshop. Refueling of machinery used at the construction site must be done from a suitable mobile diesel bowser and over a hard impermeable surface or drip pans to ensure that spilled fuel is captured and cleaned. <p><u>Breakdowns:</u></p> <ul style="list-style-type: none"> Only breakdowns may be attended to at the construction site and over an impermeable surface or drip pans. All repairs and servicing of machinery must done at the quarry workshop. Defective hoses valve and containment structures should be promptly repaired. Spill kits should be kept at the construction site and the personnel trained on emergency action required in the event of a fuel spill. All incidents must be reported to the QM. Fuel leaks or spills in excess of 200 litres are reportable incidents and must be reported to the line ministry.

3.3 AIR QUALITY

The activities associated with construction of EP will involve handling of soil which is mostly dry and therefore prone to generating dust which can impact on the ambient air quality. Dust is also expected during the hauling and sealing of the floors of the EP with clay materials.

During the operational phase little to no dust is expected.

In the event that it becomes necessary to decommission the EP, the activities associated with such a phase will be temporary in nature and the air quality impacts are expected to be fairly low. Management measures have been provided with respect to the construction phase (waste case scenario) only.

3.3.1 ENVIRONMENTAL OBJECTIVE

The objective of the management measures:

- a) To ensure that any potential impact on the ambient air quality is minimized such that social amenity and health values are maintained.
- b) To enhance and protect amenity values by ensuring that noise level from the construction is minimized.

3.3.2 MANAGEMENT ACTIONS

The management actions recommended to avoid, minimise or to completely eliminate the impacts associated with air quality are detailed in the **Table 4** below.

Table 4: Management Measures on Impacts on Air Quality

Aspect or Issues	Management Measures
These measures apply during the <u>construction</u> phases and QM is the responsible party	
Dust (created during inert landfill activities, material handling, windblown and general site operations including machinery & vehicles)	<p><u>Working Hours:</u></p> <ul style="list-style-type: none"> • Confine working hours for pond construction during day light hours only (07h00 to 17h00 – Monday to Friday) • Saturday work hours: 07h00 to 13h00. • No work on Public Holiday and Sundays <p><u>Small Quantities:</u></p> <ul style="list-style-type: none"> • Undertake site preparation (soil stripping) in small quantities at a time, allowing stockpiling and compaction to minimise drying and the risk of dust generation. • Restoration materials will predominantly consist of inert soils and soil forming materials, unlikely to generate dust. • Suspend operation during heavy windy conditions. • Should dust be observed crossing beyond the pond construction boundaries, then all infilling and processing operations should be stopped until such time that the wind drift has been brought under control. <p><u>Speed Limits:</u></p> <ol style="list-style-type: none"> 1. All earthmoving movements must comply with the specified speed limit at all times. 2. Dusty routes must be sprayed with water or covered with crushed stones in order to reduce the possibilities of dust being generated.

Aspect or Issues	Management Measures
These measures apply during the <u>construction</u> phases and QM is the responsible party	
	<p><u>Dampening:</u> 1. Appropriate dust suppression measures should be used during high dust conditions such as dampening with water or other suppression measures.</p> <p><u>Stockpiles:</u> 2. Where possible topsoil stockpiles should be located in sheltered areas where they are not exposed to erosive effects of the wind. Where erosion of stockpiles becomes a problem, erosion control measures must be implemented. This could include grassing, reducing the size of the stockpile or positioning the stockpiles in areas where they are not exposed to wind erosion.</p> <p><u>Personal Protective Equipment:</u></p> <ul style="list-style-type: none"> • Employees should be provided with suitable PPE. • Employees found not wearing of PPE should be reprimanded. The onus is on individual employees to take good care of PPE provided. <p><u>Complaints:</u></p> <ul style="list-style-type: none"> • Any complaints received related to dust must be recorded by writing down the date and time, investigation and corrective action taken.
Noise & Vibrations (from site operations and movements of & equipment)	<ul style="list-style-type: none"> • No blasting will be used in the building of EPs hence no vibration is expected. • Temporary topsoil bund is likely to provide partial noise screening during the construction period. • Machinery used in the operation should be well maintained. • Unnecessary idling, revving and hooting of machinery should be avoided <p><u>Complainants:</u> 1. While the level of noise generated during the construction activities for the EP is not expected to exceed the ambient noise level experienced during normal quarrying operation, any complaints received with respect to noise must be recorded by writing down the complainant, the date and time, investigation carried out and corrective action taken.</p>

3.4 WASTE HANDLING

It has been assumed that, during the construction phase, a temporary 'lunch break site' will be established at the EP site where employees will park machinery & equipment during lunch breaks. These measures are proposed to deal with solid waste generated from such a site.

Waste will comprise of solid and hazardous waste and the management measures employed for the overall aggregate quarry should be extended to the construction phase of the EP. The measures should include waste recycling, re-use, storage, handling and disposal.

With respect to hazardous waste such as oil leaks or fuel spill from equipment and machineries, the best mechanism is always to prevent any leaks or spilling from occurring as opposed to cleaning up afterwards. Effective maintenance and pre-start checks at the beginning of the shift is always the best preventative measure.

3.4.1 ENVIRONMENTAL OBJECTIVE

The environmental objective recommended with respect to waste management is to strive to enhance and protect amenity values by maintaining a hygienic and waste-free EP construction site.

3.4.2 MANAGEMENT ACTIONS

Some of the minimum measures recommended in order to minimise or to avoid impacts associated with waste are described in **Table 5** below.

Table 5: Management Measures on Waste Handling

Aspect or Issues	Management Measures
These measures apply during the <u>construction</u> phases and QM is the responsible party	
<p>Impacts from poor solid waste management are:</p> <ul style="list-style-type: none"> • Visual nuisance • Odour nuisance • Health hazard • Amenity nuisance 	<p><u>Waste Sorting</u></p> <ul style="list-style-type: none"> • Non-biodegradable and recyclable waste (plastics, cans, bottles, packaging materials, metal scraps, etc.) should be stored in containers and brought to the quarry site for disposal in the usual manner. • Organic waste (food items, etc.) should be stored in bins with secure lids and not fed to animals. • Avoid wind dispersal of papers and plastics as it results in visual nuisance. Plastics can be fatal to animals when confused. • Maintain a high standard of housekeeping at the temporary site including a portable toilet for use by the crew involved in the construction.
<p>Hazardous (fuel and engine oil leaks)</p>	<p><u>Spill Kits:</u></p> <ol style="list-style-type: none"> 1. Ensure spill kits are provided and personnel trained on how to deal with any leaks. <ul style="list-style-type: none"> • Ensure that the maintenance of machinery and equipment is done on a regular basis. <p><u>Fuel and Oil Storage</u></p> <ul style="list-style-type: none"> • No fuel may be stored on the EP construction Site. All fuel and oil should be kept at the quarry workshop. • Application of fuel and oil should be handled by trained personnel with the knowledge on how to respond in the event of a spill. <p><u>Breakdowns</u></p> <ul style="list-style-type: none"> • Only breakdowns may be attended to at the EP construction site by taking measures recommended for breakdowns. • All hazardous items replaced (oil filters, batteries, etc.) must be taken to the quarry workshop for safe storage and disposal.

3.5 HEALTH, SAFETY & SECURITY MEASURES

It is essential that safety and security measures relating to the construction of the EP are identified and implemented so that the construction site is adequately protected from being accessed by unauthorized people as well as livestock in the area. It is also important that a health and safety management system is developed by management to deal with the construction of the EP. The objective of such a system is to ensure:

- a) A healthy and safe work environment.
- b) Safety system of work.
- c) Safe machinery and equipment.

The availability of such information, instruction and training is required for the health and safety of personnel, visitors and the general public.

In the execution of all activities related to the construction of the EP, it is important that an induction is provided to all employees on health and safety skill sets that will be required for the successful implementation of the project.

3.5.1 ENVIRONMENTAL OBJECTIVE:

The environmental objective should be centered on the protection of amenity values and business efficiency by ensuring that a high standard of health, safety and security is maintained throughout the construction of the EP.

3.5.2 MANAGEMENT MEASURES

The management actions recommended to minimise the impacts that are likely to result from the operation with respect to health, safety and security are highlighted in **Table 6** below.

Table 6: Health, Safety & Security Measures

Aspect or Issues	Management Measures
These measures will apply during the <u>construction</u> phases and QM is the responsible party	
Access to EP	<ol style="list-style-type: none"> 1. During the construction phase a single access point to the EP construction site should be provided which should be clearly demarcated. 2. No one should enter the construction site when under the influence of alcohol or drugs. Also, areas that are out of bounds or marked as a dangerous area should only be entered with the permission of the QM. 3. Any damage to any existing infrastructure or items on the construction site should be reported to QM who should order for repairs to be made. 4. Only drink fresh water from designated points at the quarry.
Safety Around the Construction Site	<p><u>Signage & PPE</u></p> <ul style="list-style-type: none"> • Adequate signage should be provided around the construction site. • Provide suitable PPE to personnel working in dusty and noisy areas. • Demarcate all areas to be excavated with danger tape or other suitable visible device. • No use of alcohol should be allowed during work hours. • No weapons (knives, guns, etc.) must be allowed on the work place. • Provide a portable toilet if EP site is far from the quarry facilities. • Provide a fully equipped First Aid kit with personnel trained on the use of the first aid kit.
Good Housekeeping Practice:	<ul style="list-style-type: none"> • Maintain good housekeeping around the construction site. • No littering should be allowed. • Apply good waste management with waste storage containers available at the sites. • Discourage use of 'bush' as toilet. • No use of drugs should be allowed. • Discourage foul language amongst the workers

Aspect or Issues	Management Measures
These measures will apply during the <u>construction</u> phases and QM is the responsible party	
<u>Fire</u>	<ul style="list-style-type: none"> • Soil materials used do not pose any risk of self-combustion, nor will any potentially combustible materials be permitted on site. • Uncontrolled burning of materials on site is prohibited. • Machinery should have fire-fighting equipment that are kept in a good working order. • Smoking should only be permitted in designated areas. • Fire emergence procedures should be established and employees well trained on how to respond to any fire occurring.
<u>Explosive</u> (from compressed gas cylinders)	<ul style="list-style-type: none"> • No compressed gas cylinders may be kept on the EP site. All gas cylinders must be kept at the quarry workshop. • Any breakdown at the EP site that may require welding, gas cylinders should be brought to the site in secure devices. • Only trained personnel may handle compressed gas cylinders. • After use gas cylinders must be taken to the workshop. <p>1. Smoking is not allowed where welding with gas cylinders is being used.</p>
<u>Vandalism</u> (damage or theft to site equipment/plants)	<ul style="list-style-type: none"> • Any plants remaining on the construction site after hours should be left in a secure manner. • Outside of working hours, the site must be appropriately secured to avoid unauthorized access which could lead to theft and or vandalism.

3.6 BIODIVERSITY

Biodiversity is understood when one appreciates all its components – species of plants and animals and the different habitats in which they live (biodiversity patterns) and the ecosystem processes (how the various plant species, animals, and the factors such as wind, water and pollinators interact).

The EP will be constructed in an area which had been de-bushed and cleared of most vegetation in preparation for cultivation.

3.6.1 ENVIRONMENTAL OBJECTIVE

Maintain and upheld the integrity of the ecosystem throughout the construction and operation of the EPs.

3.6.2 MANAGEMENT ACTIONS

In **Table 7** below, are the management actions recommended to avoid, minimise or to completely eliminate the impacts associated with biodiversity.

Table 7: Management Measures on Impacts on Biodiversity

Aspect or Issues	Management Measures
These measures will apply during the <u>construction</u> phases and QM is the responsible party	
<p>Floral impacts: 1. Loss of habitat 2. Displacement 3. Soil erosion 4. Fire risk</p>	<p><u>Minimal Vegetation Removal</u></p> <ul style="list-style-type: none"> • Observe the measures recommended for siting of EPs. The area selected for EP should involve the least removal of vegetation and trees. • The EPs should be sited away from sensitive areas and big trees should be preserved and not uprooted. • Trees where birds are nesting must be avoided and such bird(s) should not be disturbed. • No trees may be chopped down for firewood harvesting or for any other purpose. <p><u>Pond Walls and Slopes</u></p> <ul style="list-style-type: none"> • The slopes of the EPs must be maintained with proper vegetation in order to prevent erosion or loss of soil. • Banks or slopes should be well maintained as eroded banks will make it difficult to access the EPs which increases the potential for leaks and ultimately collapse of the banks. <p><u>Truck Movements</u></p> <ul style="list-style-type: none"> • Confine truck movements outside the EP site to well-planned and well maintained internal routes. • All activities should be well planned and diligently executed so as to avoid unnecessary disturbances to the natural environment. <p><u>Riparian Ecosystem</u></p> <p>It is inevitable that a Riparian Ecosystem (areas of transition zone between wet and dry areas) would establish in and around the pond environment. Such sites tend to be moisture and have more plant community that is distinct from the surrounding habitat.</p> <p>Riparian areas would accommodate plants that are adapted to growing on saturated soils with low oxygen levels for much of the year. Invertebrates such as many species of dragonflies and damselflies, amphibians and reptiles would use riparian areas for breeding, developing young, feeding and shelter.</p> <p>The Riparian Ecosystem has both advantage and disadvantages and should be well managed.</p>
<p>Faunal impacts: 1. Loss of habitat 2. Loss of grazing 3. Displacement 4. Killings 5. Fire risk</p>	<p><u>Habitats:</u></p> <ul style="list-style-type: none"> ○ The EP should be sited away from any sensitive areas or where evidence of active habitats appear to occur. ○ No animals may be killed, hunted down, trapped, injured or lured to the EP construction site. <p><u>Wetland Ecosystems</u></p> <p>It should be expected that a Wetland Ecosystem would develop in and around the EP which should be protected and safeguarded. A wetland is home to invertebrates such as amphibians, reptiles, birds, plants and mammals. Wetlands are used by these species to breed, develop their young ones, feed and forage as well as for shelter.</p> <ul style="list-style-type: none"> ○ Wetland is threatened by pond drainage, infilling, water pollution, etc. ○ Bank erosion, loss of riparian vegetation and habitat fragmentation would also destroy wetland. ○ Fish can be introduced to the pond but the fish population could grow and become unmanageable. ○ If the water is used for irrigation introducing fish would not be feasible.

3.7 ARCHAEOLOGICAL, HERITAGE AND CULTURAL ASPECTS

The proponent is expected to respect all matters of archaeological and cultural heritage significance. Whilst there are no known items of cultural and heritage remains, it is recommended that training be provided in this regard so that workers are sensitized and informed of what to do in the event of such items being uncovered during the construction phase.

3.7.1 ENVIRONMENTAL OBJECTIVES

Ensure due consideration is given to matters of archaeological, heritage or cultural nature by safeguarding and protecting any findings until confirmation on what to do is granted by the NHC.

3.7.2 MANAGEMENT ACTIONS

The management actions recommended in order to avoid, minimise or to completely eliminate the impacts associated with heritage and cultural aspects are listed in **Table 8** below.

Table 8: Management Measures on Potential Impacts on Heritage & Cultural Matters

Aspect or Issues	Management Measures
These measures apply during the <u>construction</u> phases and QM is the responsible party	
Heritage & Archaeological Finding: (tools, coins, etc.)	<p>Should a Cultural Heritage site or an Archaeological site of interest be uncovered during the construction activities, i.e. a “chance find” proceed as follows:</p> <ul style="list-style-type: none"> • If operating a machine stop work immediately; • Demarcate the site with plastic warning tape. • Cease any works in the immediate vicinity. • Determine GPS position if possible. • Report findings, site location and actions taken to QM. • No item(s) must be removed from the site. • Advise the office of NHC and request written permission to remove findings from work area. • Recover, pack and label findings for transfer to the National Museum as guided by NHC.
Human Remains: (skull, bones, etc.)	<p>Should human remains be found, follow these guidelines:</p> <ul style="list-style-type: none"> • Apply the chance find procedure as described above; • Notify the nearest Namibia Police Office • Schedule a field inspection with an archaeologist to confirm that remains are human; • Advise and liaise with the NHC and the Police. • Remains to be retrieved and transported by the Police either to the National Museum or the National Forensic Laboratory in Windhoek. • Work must only resume only the remains have been successfully retrieved.

3.8 VISUAL DISTURBANCES

At the height of approximately 1.5 m, the walls of the EP have the potential to alter the general landscape of the aggregate quarry site and surrounding areas. However, the general area where the EP will be constructed has already been disturbed through activities such as de-bushing and vegetation clearing when the land was prepared for cultivation. The landscape character has been impacted especially along the section of old Rundu-Divundu gravel road and the gravel road linking the village to the B8 highway.

3.8.1 ENVIRONMENTAL OBJECTIVE

The environmental objective proposed Ensure that the construction and operation of the EP do not alter the existing views of the surrounding areas but are made to blend in well and to enhance the sight.

3.8.2 MANAGEMENT ACTIONS

The management actions recommended in order to avoid, minimise or to completely eliminate visual disturbances are described in **Table 9** below.

Table 9: Management Measures on Visual Disturbances

Aspect or Issues	Management Measures
These measures apply during the <u>construction</u> phases and QM is the responsible party	
Earthworks	<ol style="list-style-type: none"> 1. During earthworks, all reasonable measures should be taken to prevent excessive dust. 2. Keep the working footprint of the EP to the minimum size possible, and carry out rehabilitation once no longer in use.
Material Hauling	<ol style="list-style-type: none"> 1. Implement dust control measures including sticking to speed limits such that dust is not blown out of the site becoming a visual nuisance to the surrounding community. 2. When windy conditions are unfavorable, work should be stopped until such time that the wind condition improves.
Light pollution	<ol style="list-style-type: none"> 1. Light over the EP should be carefully considered and kept to the minimum without compromising security and safety aspects. 2. Ensure that security light at the EP does not offend village residents. The lighting layout should direct lights inwards to the EP and not outwards to the village. 3. Avoid using bright, white colour lights where possible. Preferable use lights emitting a yellow light which travels less than the white coloured lights.
Structures	<ol style="list-style-type: none"> 4. Any structure erected permanently at the EP site, i.e. pump house, etc. should be painted with a matte finish in a shade of grey that would best reduce the colour contract between the structure and the receiving landscape.
Berms	<ol style="list-style-type: none"> 5. The berms of the EP should be vegetated as much as possible with the existing vegetation that is found within the project area.
Housekeeping	<ol style="list-style-type: none"> 6. Maintain a high standard of housekeeping which includes cleaning of all areas the EP site. 7. Wind-blown papers and plastics around the EP should be regularly picked up to avoid visual nuisance.

4. PARTIES RESPONSIBLE

In this section, the parties responsible for the implementation of the EMP for the construction and operation of the EP are described.

4.1 THE QUARRY MANAGER (QM)

At the hard rock quarry operated by Crushco at Kangongo, the QM has the overall responsibility for all environmental management. The size and scale of the operation does not justify the appointment of a fulltime environmental officer. Therefore, the QM will be responsible for ensuring the effective implementation of this EMP.

4.2 SPECIFIC EMP TASKS

Amongst the tasks that the QM has to implement with respect to the EMP for the construction and operation of the EP are:

- To ensure that the commitment measures as set out in the EMP are implemented during the design, construction, operation and decommissioning stages of the EP.
- To conduct regular inspections and auditing to this EMP and any other relevant legal requirements, e.g. water abstraction permits, dewatering permits, renewal of the ECC, etc.
- Conduct environmental awareness training to the workforce before the construction phase starts and on an ad hoc basis throughout the construction and operational phases.
- To conduct scheduled monitoring or any other additional monitoring required by the permit and authorisation issued to Crushco by the relevant authorities.
- To ensure compliance to this EMP and any permits and authorizations issued to Crushco by the relevant authorities
- To investigate any complainant made by any stakeholders with respect to the dewatering activities and the EP operation and take corrective action including providing feedback where warranted.
- To take action against those employees who violate the provisions of the EMP.
- To ensure that major incidents or accidents (i.e. oil spill exceeding 200 litres) are reported to the relevant authorities timeously.

5. MONITORING

5.1 INTRODUCTION

In this section of the EMP, monitoring guidelines are briefly outlined which should be implemented by Crushco in order to ensure proper functioning of the EP as well as to help detect any defects and or malfunctioning. The primary objective of monitoring is to ensure that the mitigation measures that have been put in place are working as intended and that unanticipated environmental impacts do not occur. The effectiveness of the mitigation measures should also be evaluated and where shortcomings are detected, adjustments made accordingly.

5.2 MONITORING

Crushco should develop a detailed monitoring schedule and procedure for its EP constructed for the dewatering of its quarry pit. As a general approach, the monitoring should provide for the following aspects:

- A formal procedure should be developed and followed upon. This essential during the first few months into the operations of the EP.
- Where samples are required for analysis, such samples should be preserved according to laboratory specifications and guidelines.

- The parameters to be monitored should be developed and agreed upon with the line ministry or relevant authority.
- Any monitoring data taken from the EP such data should be stored in a structured manner and kept for the duration of the validity of the ECC.
- In the event that monitoring points become redundant or damaged then they should be replaced with new points.

5.3 INSPECTION AND MAINTENANCE

For the long term operation of the EP, it is important that an inspection and maintenance schedule is drawn up and implemented by Crushco. The aspects that should be covered are described in **Table 10** below. The responsible person is the QM who can delegate such functions to an experienced staff member.

Table 10: Proposed Inspection and Maintenance Schedule

Aspect	Description	When
Structural Defects	Check that EP shows any signs of settling, cracking, bulging, misalignment or other structural defects	Within 3 months
Erosion Signs	Check for any erosion on the embankments, on spillways and on external slopes. Walk all around the EPs.	Before the wet seasons
Pond Access:	Ensure that any roads to the EP are well maintained to allow safe access of any equipment and machinery that may be required for the purpose of maintenance	Every 3 months
Vegetation	Is there evidence of sparse vegetation and grass covering and growing on banks and slopes of the EP? If vegetation is dead, consider replanting.	Monthly
Riparian System	Is there any signs of habitats (fish, invertebrates, birds, mammals, etc.) developing in the riparian area created by the EP?	Monthly
Evaporation Rate:	The water level in the EP should be recorded on a weekly basis for the purposes of determining average evaporation rates and or for any signs of possible leakage. It is important the evaporation rates are determined and the time that such evaporation occurs recorded. Once peak evaporation rate has been determined, pumping from the quarry pit can be set to correspondence with such period.	Check and record weekly
Safety Equipment	EPs, just like any waterbodies are likely to attract invited and uninvited people. It is important that warning signs are placed around the EP and the inspection of such signs should be carried out as part of monitoring.	Within 6 months
Sediments or silt	Check and record the level of sediments/silt accumulation at the bottom of the EP. Remove sediments when about 40% of EP has been covered by sediments.	Check yearly and remove 5 yearly
Groundwater	In the absence of boreholes drilled around the aggregate quarry from which the level and potential contamination of groundwater from pollution sources could be monitored, it is recommended to keep in check the floor level of the quarry pit. It is logical that if any blast hole drilled on the quarry floor intersects any substantial amount of groundwater, water will flow into the quarry pit, making charging the blast holes with explosives an impossible task. When this happens, the water table level would have possibly been reached.	
Surface water run-off	Berms and or channels should be constructed to prevent surface run-off from entering the quarry pit and the EPs. Surface run-off from the workshop area should be diverted and not allowed to enter the quarry pit.	Check 6 month intervals
Water quality testing	Have the water samples from EP and quarry pit analysed and tested to determine and compare contamination levels.	