DRAFT

AMENDED ENVIRONMENTAL MANAGEMENT PROGRAMME FOR BUSHVELD VAMETCO MINE OPERATIONS IN BRITS WITHIN THE JURISDICTION OF MADIBENG LOCAL MUNICIPALITY IN THE NORTHWEST PROVINCE

MINING RIGHT NO.: NW30/5/1/2/2/08MR

SUBMISSION DATE

OCTOBER 2023

PREPARED FOR

BUSHVELD MINERALS

PREPARED BY

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PROJECT TITTLE:

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ACRONYMS

AIP	Alien Invasive Plants
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Areas
COP 21	Conference of Parties
DAFF	Department of Agriculture, Fisheries and Forestry
DEA	Department of Environmental Affairs
DHSWS	Department of Settlement Water and Sanitation
DMRE	Department of Mineral Resources and Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EM	Environmental Manager
EMPr	Environmental Management Programme
EO	Environmental Officer
GHG	Green House Gas
Ha	Hectares
HAS	Hazardous Substance Act (Act 15 OF 1973)
HOD	Head of Department
HDPE	High-Density Polyethylene
HIA	Heritage Impact Assessment
KM	Kilometres
LoM	Life of Mine
MHSA	Mining Health and Safety Act
MM	Mine Manager
MPRDA	Mineral Petroleum Resources Development Act
MRA	Mining Right Area

MS	Method Statement
MS	Method Statement
MTPA	Million Tons Per Annum
NCCAS	National Climate Change Adaptation Strategy
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Air Quality Act (Act 39 of 2004)
NEMBA	National Environmental Management Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management Waste Act (Act 36 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act 25 of 1999)
NWA	National Water Act (Act 36 of 1998)
OHSA	Occupational Health and Safety Act (Act of 85 of 1993)
OM	Operational Manager
PCD	Pollution Control Dam
RBCT	Richard's Bay Coal Terminal
ROM	Run of Mine
RTA	Road Traffic Act 93 of 1996
RWD	Return Water Dam
SACNASP	South African Council of Natural Scientist Profession
SAHRA	South African Heritage Resources Agency
SANS	South African National Standard
SCC	Species of Conservation Concern
SHEC	Safety Health Environment and Community
TSF	Tailings Storage Facility
UNFCCC	United Nations Framework Convention on Climate Change
WRD	Waste Rock Dump
WULA	Water Use Licence Application

1 INTRODUCTION AND BACKGROUND

Bushveld Vametco Holdings (Pty) Ltd (hereafter referred to as Vametco) is an open-cast mine situated approximately 5km west of Ga-Rankuwa and 10km northeast from Brits town within the jurisdiction of Madibeng Local Municipality in the Northwest Province and has been operational since 1967. The mine is approximately 3.5 km long in an east-west direction and its Mining Right Area (MRA) is approximately 1507.7427 hectares (ha) in size. Vametco is regarded as a low-cost primary vanadium mining and processing company with a 186.7 metric tonnes (Mt) Joint Ore Reserves Committee (JORC) compliant resource averaging 1.98% vanadium pentoxide (V_2O_5) in magnetite grades (including 48.4 Mt in reserves). It utilises a well-established salt roast processing method to produce refined vanadium in the form of Nitrovan and Vanadium Oxide (NVO).

Vametco's processing plant receives ore from the Vametco mine and employs the standard salt roast and leach process to produce a steel-alloying vanadium carbon nitride product called Nitrovan. The process involves the following stages:

- Step 1: Crushing, milling and magnetic separation to produce a magnetite concentrate with average grades of approximately 2.0 % V2O5 in magnetite;
- Step 2: Salt-roasting the concentrate, where the concentrate is roasted with sodium salts in a kiln at approximately 1,150°C to form a water-soluble sodium vanadates material;
- Step 3: Leaching and purification, with the dissolution of roasted vanadium concentrate in water, purification, and precipitation of vanadium through the addition of ammonium sulphate followed by drying and then processing in a reducing environment to produce a Modified Vanadium Oxide ('MVO') product; and
- Step 4: Nitrovan production: the MVO is briquetted and fed into a shaft induction furnace in a nitrogen atmosphere to produce Nitrovan, which is used as a micro-alloy in steel production.

Vametco was issued with an Environmental Authorisation on the 10th of October 2022 for the Phase 1- 3.5 MW solar photovoltaic (PV) plant and a 1 MW / 4 MWh Vanadium Redox Flow Battery (VRFB). Hence, the proposed Phase 2 of the Vametco Hybrid Mini Grid Project which is also within the Mining Right Area (MRA). The Phase 2 Hybrid Mini Grid will include the installation of a solar PV plant up to 400 MW, Battery Energy Storage System (BESS) of up to 200 MW / 800 MWh capacity, and associated infrastructures. The electricity generated will be utilised at the Mine and the surplus energy wheeled to third-party off-takers through the Eskom network. The project entails the development of the following:

- 400 MW photovoltaic (PV) fixed tilt solar park.
- Battery Energy Storage System (BESS) of up to 200 MW / 800 MWh capacity.
- 132KV Powerline; and
- Access roads.

Therefore, Nsovo Environmental Consulting (hereafter Nsovo) has been appointed by Bushveld Vametco to amend the Environmental Management Programme (EMPr) as part of the Part 2 Environmental Authorisation Amendment (EAA)

process for the proposed Solar PV Plant. The EMPr will be a guideline for the mitigation and management measures to be implemented during the construction, operation, and decommissioning/closure phases of the proposed activities. Vametco has an existing EMPr which was authorised by the Department of Mineral Resources and Energy (DMRE) in 2021 with reference number DMR ref: NW30/5/1/2/2/08MR. As part of the EA Amendment process for the proposed project it is required that the EMPr be amended to include the new activities. This provides an opportunity for Vametco to consolidate align their EMPr with the requirements of the legislation as amended.

The EMPR is prepared in terms of the provisions contained within Appendix 4 of GN R. 982 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA): EIA Regulations of 2014 as detailed below aims to achieve the following.

1.1 PURPOSE AND SCOPE OF THE EMPR

An Environmental Management Programme (EMPr) is defined as an environmental management tool used to ensure that undue or reasonable avoidable adverse impacts of the construction, operation, and decommissioning of a project are prevented or mitigated and that the positive benefits of the project are enhanced. This EMPr serves as a guideline for the management of the site and provides specifications and regulations that must be adhered to in all instances. It is the responsibility of all parties, including contractors and sub-contractors, involved in the daily activities to commit to the implementation of the EMPr throughout the project.

This EMPR is prepared to provide specific environmental guidance for the Vametco Mine constructions, operations and decommission phases and includes all activities taking place within the existing Vametco Mining Right Area (NW30/5/1/2/2/08MR). The EMPr sets out general environmental specifications, which apply to the construction, operational, and decommissioning phases associated with the proposed project.

The EMPr has been developed to give effect to precautionary measures, which are to be in place for monitoring of the activities that will take place on-site, and to ensure compliance with the national legislative and regulatory requirements, as well as Vametco' s monitoring guidelines and implementation tools associated with their other mine.

The objectives of the EMPr are as follows:

- Ensure that the activity is undertaken in compliance with national and provincial environmental legislation as well as local by-laws and policies.
- Detail mitigation measures, timeframes, and criteria for assessing the success or failure of each measure.
- Provide detailed monitoring programs to ensure compliance;
- Provide input and strategies for environmental quality control and risk management;
- To preserve the natural environment by limiting destructive actions on-site;

- Ensure appropriate restoration of areas affected by the proposed activities;
- Prevent long term environmental degradation; and
- • Ensure that activities consider the rights of other land users to enjoy a safe and healthy living environment.

1.2 LOCALITY OF THE PROPOSED PROJECT

The proposed study area is situated approximately 5km west of Ga-Rankuwa and 10km northeast of Brits town. The approximate center co-ordinates for the study area are 25°33'31.62"S, 27°54'2.19"E. Figures 1 and 2 below illustrate the project locality at a scale of 1:50 000. Refer to **Appendix A** for the A3 locality map.

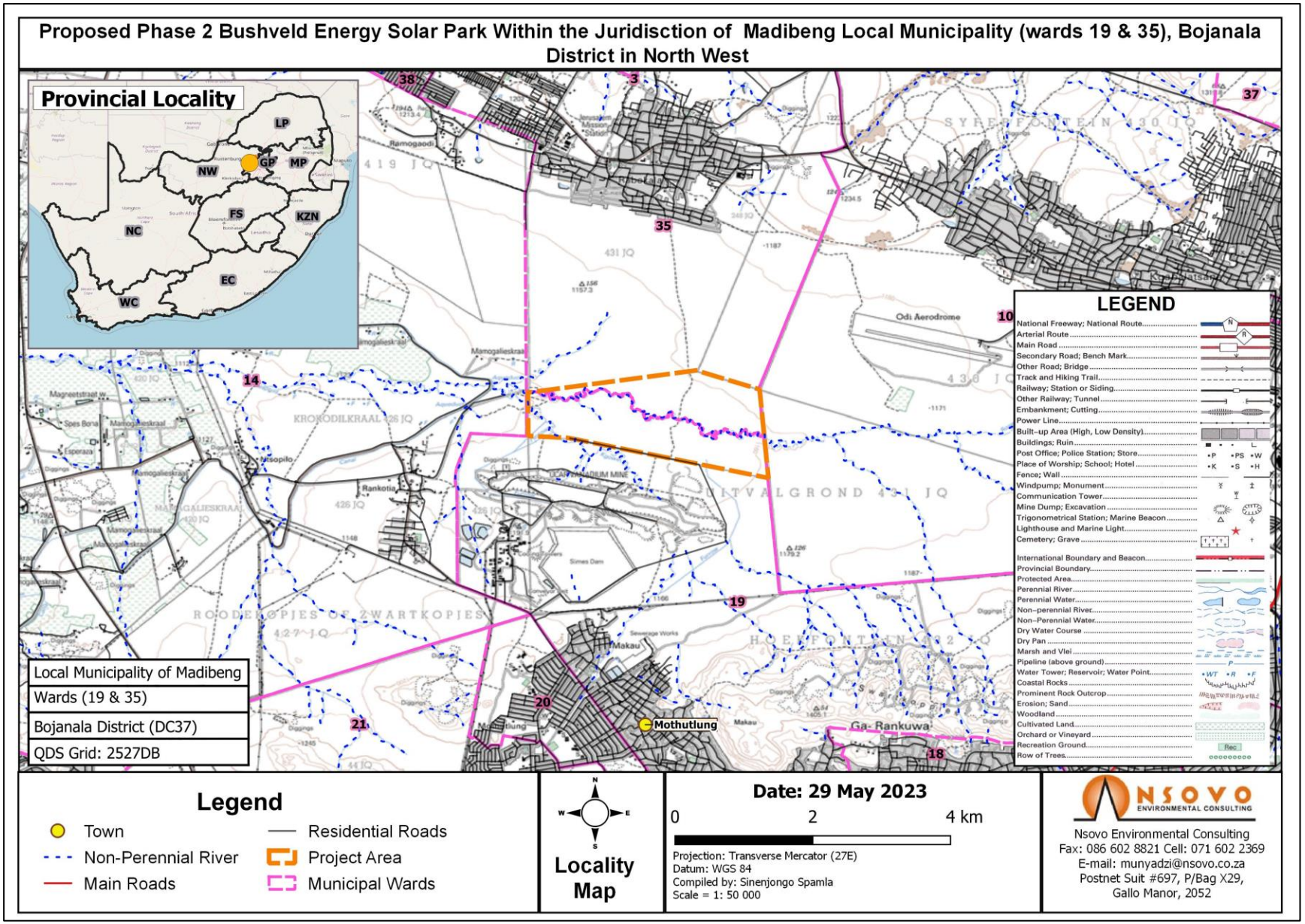

Figure 1: Locality map of the proposed project area.

1.2.1 Description of the property

The MRA traverses two farm portions, while the farm affected by the proposed development is Portion 1 of the farm Uitvalgrond 431 JQ. Table 1 below provides the 21 digits surveyor-general code of the affected land parcel as well as the farm names.

Table 1: Details of the proposed site property

Farm Name	SG Codes	Portion Number	Hectares	Division
Krokodikraal 426	T0JQ00000000042600001	Portion 1	272.1358	JQ
Uitvalground 431	T0JQ00000000043100000	RE	1235.6069	JQ

2 STRUCTURE OF THE EMPR

The EMPr has been compiled in terms of the provisions contained within Appendix 4 of GN R. 982 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA): EIA Regulations of 2014, as amended. The requirements thereof are cross-referenced with the various sections in this report, as detailed in Table 2 below.

Table 2: 2014 NEMA EIA Regulations EMPr Report Content

No	Requirement	Reference
1(1)(a)	Details of- i) The EAP who prepared the report; and ii) The expertise of the EAP, including curriculum vitae;	Section 3
1(1)(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 4
1(1)(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Section 5
1(1)(d)	A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed, and mitigated as identified through the environmental impact assessment process for all phases of the development including- (i) planning and design; (ii) pre-construction activities;	Section 6

No	Requirement	Reference
	(iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	
1(1)(e)	A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Section 7
1(1)(f)	A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to- (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Section 8
1(1)(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 8
1(1)(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 8
1(1)(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;	Section 8
1(1)(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 8
1(1)(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 9
1(1)(l)	A program for reporting on compliance, considering the requirements as prescribed by the Regulations;	Section 9
1(1)(m)	An environmental awareness plan describing the manner in which-	Section 10

No	Requirement	Reference
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with to avoid pollution or the degradation of the environment; and	
1(1)(n)	Any specific information that may be required by the competent authority.	Section 11

3 DETAILS AND EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER INCLUDING THE APPLICANT'S DETAILS, ORGANISATIONAL STRUCTURE AND ROLES

3.1 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nsovo has been appointed by Vametco as the independent Environmental Assessment Practitioner (EAP) for the proposed project and meets the general requirements as stipulated in Regulations 13 (3) of the NEMA EIA 2014 Regulation as amended. Nsovo therefore is:

- Independent and objective;
- Has expertise in conducting EIAs;
- Considers all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

Table 3 below provides the details of the EAP and relevant experience. A detailed CV and qualifications of the EAP is attached as **Appendix E1**.

Table 3: Details of the Environmental Assessment Practitioner (EAP)

Name of Company	Nsovo Environmental Consulting
Person Responsible	Rejoice Aphane
Professional Registration	EAP EAPASA: Registration No. 2019/1277
Telephone Number	076 751 3476
Email	rejoice@nsovo.co.za
Qualifications & Experience	• Environmental Management • 10 years of experience
Project Related Expertise	In terms of project related expertise, the EAP has worked on the following projects:

	• EIA and WULA for the proposed Exxaro Dorstfontein Expansion Project. • EIA for the proposed Shongweni substation and Hector - Shongweni 400kV powerline in KwaZulu Natal Province. • EIA for the proposed Inyaninga substation and Inyaninga – Mbewu 400kV powerline in KwaZulu Natal Province. • EIA for the proposed Tubatse strengthening Phase 1 – Senakangwedi B integration within the jurisdiction of Greater Tubatse Local Municipality in Limpopo Province. • EMPr, WULA and EA amendment for the proposed Juno - Gromis 400kV power line. • Basic Assessment for the proposed Decommissioning and Demolition of Verwoedberg Substation and 275kV power.

3.2 DETAILS OF THE APPLICANT

The applicant is Bushveld Vametco (Pty) Ltd, and the company details are provided in Table 4 below.

Table 4: Details of the Applicant and Responsible Person at the mine

Details of Applicant	
Name of Mine	Bushveld Vametco Holdings (Pty)Ltd
Physical Address	Main Mothutlung Road Extension Farm Krokodilkraal, District ODI Northwest Province 0250
Postal Address	P.O. Box 595 Brits 0250
Contact Details	011 441 6890
Details of Responsible Persons at the Mine	

Details of Applicant		
Role	Environmental Manager	Project Manager
Contact Person	Rudzani Mudau	Fredrick Mphephu
Telephone Number	012 318 3382	012 318 3200
Email	rmudau@bushveldvametco.co.za	fmphephu@bushveldvametco.co.za

3.3 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

To operate with utmost care of the environment effectively and efficiently within which Vametco operates all parties must understand their duties and responsibilities throughout all phases of the project lifecycle. Vametco and their duly appointed Contractors and Sub-contractors are fully responsible for all activities taking place and ensuring that they are undertaken in compliance with the project's EA and EMPr as well as world best practice. The following sections describe the roles and responsibilities of the key team members.

3.3.1 Bushveld Vametco Holdings (Pty) Ltd.

Vametco must ensure that the implementation and compliance of all environmental authorisations and permits as well as obligations emanating from other relevant environmental legislation throughout the project lifecycle, and this would include the following:

- Ensuring that all team members are aware of their roles and responsibilities;
- Taking overall responsibility for all activities that occur in the proposed project and associated infrastructure;
- Ensuring that all commitments/conditions in the EA and EMPr are communicated and adhered to by Vametco employees to all team members and contractors.

Vametco's role troughout the different phases of the project are summarized below:

- Appoint a Project Manager to oversee the Contractor and act as a liaison between the Contractor, the Environmental Control Officer (ECO) and the Operations Manager
- Appoint an Environmental Control Officer (ECO) and the Contractor.
- Ensure that the Contractor is aware of and adheres to the provisions of this EMPr.
- Ensure that the Contractor remedies problems timeously and to the satisfaction of the authorities.
- Appoint a suitably qualified ECO to ensure that the Contractor abides by the EMPr; and
- Ensure that an independent ECO monitors and audits the site to ensure compliance with the respective Authorisation, permits and licenses.

3.3.2 Buisness Unit Manager

The Business Unit Manager (BUM) will report to the Vametco Management and will:

- Be fully knowledgeable with the contents of this EMPr and conditions of the environmental authorization, and other permits;
- Be fully knowledgeable with the contents of all relevant environmental legislations and ensure effective compliance;
- Ensuring that Vametco and its contractors are made aware of all stipulations in the EMPr;
- Has overall responsibility of the EMPr and its implementation;
- Ensure compliance with the EMPr and EA commitments, and any other legislative requirements applicable to their operations.
- Ensure there is effective communication with the Project Manager, the environmental control officer and relevant engineers on matters concerning the environment; and
- Adhering to any instructions issued by the Project Manager on advice of the ECO.

3.3.3 Environmental Control Officer (ECO)

This EMPr has been compiled in fulfilment of the requirements of the National Environmental Management Act (Act 107 of 1998) and other associated regulations and is therefore legally binding. Vametco's responsibility include the appointment of a suitably qualified ECO for the duration of the project; responsible for implementing the EMPr and associated policies, procedures, and bylaws. The ECO is required to ensure that all personnel involved in the project are trained and familiar with the requirements of the EMPr. More specifically, the responsibilities of the ECO's include the following:

3.3.3.1 Communication Services

- To liaise closely with Vametco and the Contractor's Environmental Officer (EO).
- To ensure that the landowner agreed General and Special Conditions are implemented.
- To assist in conflict resolution.
- To ensure that the Contractor rehabilitates any damage caused during construction.
-

3.3.3.2 Environmental Management (EM)

- Monitoring of site environmental progress in respect of time, deliverables, and quality.
- Liaison between Authorities, Vametco and Contractor on environmental matters.
- Recommending EMPr modifications to Vametco as and when the site conditions warrant it.
- Communicating changes of the EMPr to all relevant parties.

- Issuing Contractors Communications and site instructions.
- Monitoring performance of Contractor and sub-contractors to ensure compliance with environmental and statutory requirements.
- Checking the Contractor EO's record of environmental incidents (spills, impacts, legal transgressions, etc.) as well as corrective and preventive actions taken.
- Checking the Contractor EO's complaints register in which all complaints are recorded, as well as actions taken.
- Compiling and completing the environmental management related component of the handing-over documentation and any other related documents.
- Timeously identifying any sensitive site issues which may affect environmental aspects and the reporting of this to Vametco.
- Monitoring that good housekeeping practices are followed and maintained by the Contractor.
- Monitoring that the ground rehabilitation is initiated on time, complying with the EA, EMPr and to the satisfaction of the landowner.
- Assisting the Contractor and Vametco EO with the environmental awareness training course to all site staff, targeted at the level of the workers so that they have a basic understanding of the environment that they are working in.
- Ensuring that sensitive areas are demarcated within or alongside the construction areas i.e., sites identified in the EMPr, EA.

3.3.3.3 Monitoring

- Validating the site environmental monitoring plan.
- Carrying out environmental surveillances.
- Validating and recording of certificates proving the legal disposal of waste streams.

3.3.3.4 Reporting

- To complete a daily diary and monthly reporting.
- To prepare monthly monitoring reports for submission to Vametco and the DMRE, Environmental Compliance Section as and when required.
- Manage the compliance of the Contractor according to the EA, EMPr and landowner conditions. The reports are to include photographic images of compliances, non-compliances and special occurrences taking place during the reporting period.
- To attend site meetings as required.
- To inform Vametco of any activity that is not in accordance with the EA and respective Conditions, the EMPr and Landowner' agreed general and special conditions or detrimental to the environment.

3.3.3.5 Administration

- To assure a proper site ECO administration function to cater for all environmental site related correspondence.
- To execute environmental responsibilities as per Vametco's Risk Management System.
- To promote and maintain sound relationships with the landowner, community, Contractors, and suppliers.

3.3.4 Contractor (including Sub-Contractors)

Should there be contracting of some of the services, the Contractor (including Sub-Contractors) will report to the Project Management Team and be responsible for:

- The appointment of an Environmental Representative/Environmental Officer who will ensure that all construction activities on site are undertaken in accordance with the EMPr ;
- To fulfil all obligations as per the agreed contract;
- To implement the projects as per the approved project plan;
- Drafting Environmental Method Statements for all activities to mitigate environmental impacts;
- Informing the workforce of their roles and responsibilities in terms of the EMPr ;
- Ensuring that the workforce and sub-contractors comply with this EMPr;
- Ensuring compliance with the EMPr and EA commitments and any other legislative requirements as applicable to their activities;
- Adhering to any instructions issued by the Project Manager on advice of the ECO;
- Preparation and timeous submission of environmental compliance reports that including updated incident and complaints registers;
- Induction and training of their works force as well as subcontractors prior to the commencement of construction, taking cognisance of this EMPr and EA.
- To inform and educate all employees about the environmental risks associated with the different construction activities through toolbox talks, environmental notices, and other methods with specific focus on environmental topics throughout the project.
- To provide all necessary supervision during the execution of the project and be available on site at all times;
- To ensure that implementation is conducted in line with the EA and EMPr;
- To comply with special conditions as stipulated by Landowners during the negotiation process; and
- Ensure compliance with pertinent environmental legislations and other legally binding documents.

3.4 COMPETENT AUTHORITY

The Competent Authority is the Department of Mineral Resources and Energy (DMRE), and its role is to enforce compliance with the EA and EMPr conditions.

4 A DETAILED DESCRIPTION OF THE ASPECTS OF THE ACTIVITY THAT ARE COVERED BY THE EMPR AS IDENTIFIED BY THE PROJECT DESCRIPTION

Vametco's approved Mining Right (MR) MP 30/5/1/2/3/2/1 119(123) MR) constitutes 1507.7427 ha. This EMPr is part of the Amendment of the Environmental Authorisation process for the proposed Solar PV plant, and it consolidates the proposed activities into the authorised activities that were authorised as part of the 2008 and 2021 EMPr authorised by the DMRE. Subsequently, the EMPr incorporates measures for the construction, operation, and decommissioning activities for the proposed activities.

Furthermore, Table 5 below summarises the authorised activities, categorised into operations, water, and waste management systems. These are associated with the current operations and proposed future approved projects at Vametco. A detailed map of the surface structures and infrastructure at Vametco is presented in **Error! Reference source not found.** and attached as **Appendix A**.

Table 5 : Aspects of the activities that are covered by the EMPr.

Aspect	Method/System
Mining and Beneficiation	
Open pit mining	• At the Vametco Mine, groups of magnetite-rich layers are separated into three seams: the Upper, Intermediate, and Lower seams, which dip to the north at approximately 19°. The seams occur above a distinct anorthosite layer near the contact of the Upper Zone with the underlying Main Zone. All three seams have been exposed by open pit mining on the property.
Metallurgical (processing plant / recovery)	• The Vametco processing plant receives ore from the co-located open pit mine. The metallurgical process is well-tested in a steady-state ongoing operation. Therefore, no metallurgical test work is required. The processing plant has historically performed satisfactorily with a recent annual production history of around 2,600 mtV p.a. NitrovanTM. However, a study on the current indicated maximum sectional throughputs suggests that some sections could become limiting at an annual tonnage throughput of 1.5 Mtpa for a production of around 3,400 mtV p.a. NitrovanTM.

	Key Infrastructure Include • Conveyor belt • Crushing Plant (Primary, Secondary and Tertiary) • Product laydown (course and magnetite stockpiles)

Support Infrastructure	• Workshops, offices, and administration buildings;
	• Transportation (i.e., roads and conveyors);
	• Access roads;
	• Perimeter fence
	• Ancillary infrastructure:
	  ○ Change house and security facilities;
	  ○ Diesel storage facilities;
	  ○ Weighbridges
	  ○ Wash bays;
	  ○ Water reservoirs and supply pipeline;
	  ○ Water Treatment Plant;
	  ○ Sewage Plant;
	  ○ and
	  ○ Associated infrastructure.

Water supply	• The primary source of water used by the mine is from the Hartbeespoort Irrigation Water Board through a canal. • Portable water obtained from boreholes. • Seepage water from opencast mining. • Stormwater
Soil Stockpiles	• Soil is stripped and stockpiled at a dedicated topsoil stockpile dump.
Electricity	• Power supply from Eskom. • 3.5 MW AC Solar PV Plant • **The proposed 400MW Solar PV Plant** • Emergency diesel-powered generators
Waste Management	
Magnetite dump	• Active magnetite dump is classified as hazardous waste. • The existing magnetite dump is licensed in terms of the Waste Management Act.

	• Authorised Expansion of the Magnetite Dump to the north (1) and south (2) of the mine. This expansion will be next to the existing magnetite dump of approximately 22ha.
Slimes Dam	• Existing slimes dam • Authorised slimes dam expansion.
Waste rock dump	• The current Waste Rock Dumps (WRD) are located around the open pit with a distinct footprint. • Authorised WRD
Run of Mine (ROM)	• The mine has a ROM stockpile and one product stockpile.
Domestic and Industrial Waste	• All waste sorting areas are bunded, and wash bay areas are equipped with oil traps. • Recyclable general waste is recycled, while the remaining is disposed of at a licenced landfill facility. • Hazardous waste is disposed of at licenced facilities. • Scrap Metal is recycled.
Water Management	
Sewage	• Sewage sediment is collected and disposed of appropriately at the Municipal Sewer Plant, while effluent is recycled as processed water. • Approval in place from Municipality.
Clean and dirty water management	• Mine practices clean and dirty water separation. • Dirty storm water is stored within PCDs, scrubber, barren, toe, or stormwater dams. • Authorised PCDs, the total capacity of the 2 PCDs will be 166 250m3.
Return Water Dam	• Authorised RWD to store clean water.
Water Discharge Channels	• Flume 1 and Flume 2.
In pit water storage	• Dam within the pit stores water used for processing.
Reclaim Station	• Station that facilitates water recycling

4.1 DESCRIPTION OF STRUCTURES AND INFRASTRUCTURE

4.1.1 The existing structures and infrastructures within the proposed site

The current operations at Vametco mine include opencast mining (including storm and seepage water quarries), processing plant, Class A waste disposal facility for magnetite, waste rock, slimes dam, and other associated infrastructure as illustrated in **Error! Reference source not found.** below.

4.1.2 Roads

Access to the Vametco mine is provided directly off the main road to Mothutlung, with separate access provided for heavy vehicles. The intersections between the Mothutlung Road and these accesses are priority stop-controlled, with free-flow traffic conditions on the Mothutlung Road.

4.1.3 Mining Areas

Vametco comprises of open-pit mine that supplies ore directly to the vanadium processing plant located on the same property. The open-pit is approximately 3.5 km long, in an east-west direction. The vanadium is extracted from magnetite layers occurring near the basal contact of the Upper Zone of the Bushveld Igneous Completed. The mine has been in operation since 1967.

4.1.4 Processing Plant

The Vametco processing plant receives ore from the co-located open pit mine. The metallurgical process is well-tested in a steady state of the ongoing operation. Therefore, no metallurgical test work is required. The processing plant has historically performed satisfactorily with a recent annual production history of around 2,600 mtV p.a. NitrovanTM. However, a study as to the current indicated maximum sectional throughputs suggests that some sections could become limiting at an annual tonnage throughput of 1.5 Mtpa for a production of around 3,400 mtV p.a. NitrovanTM. A description of activities associated with the processing plant is presented in Table 6 below.

Table 6: Activities associated with the processing plant.

Concentration plant	
Rotary Kiln Section	**Leaching Section**
Two vanadium-bearing feedstocks are currently used in the extraction process, such as (1) magnetite from the concentration plant and (2) vanadium-bearing slag purchased from EVRAZ Highveld Steel and Vanadium delivered by road tanker. Measured amounts of magnetite, vanadium-bearing slag, sodium sulphate and sodium carbonate are mixed and fed to the pulverized coal-fired rotary kiln where the mixture is roasted at about 1 200 degrees Celsius, rendering the vanadium water-soluble. The kiln product is then fed to the leaching section.	The kiln product is water leached. The solids are wet and washed in a counter-current process over two large belt filters. The magnetite tailings are disposed of on a TSF. The vanadium-bearing liquor is then pumped into the precipitation plant.
Extraction Precipitation plant	
The vanadium-bearing liquor is fed to the precipitation tank, where it is mixed and reacted with ammonium sulphate and recycled mother liquor from the sulphate recovery plant to form a saturated solution and Ammonium Metavanadate (AMV) to precipitated. The precipitated AMV is separated from the vanadium – depleted barren solution and washed on a belt filter before being dried in an oil-fired rotary drier. AMV is transferred to the vanadium trioxide reactors.	
Sulphate Recovery Plant	
Refining process	**MVO Production Section**
The barren solution generated in the precipitation plant is concentrated in a stream heated evaporation plant where sodium sulphate is crystallized out a separated by centrifuge from the ammonium sulphate-rich “mother liquor.” The sodium sulphate is recycled to the kiln, and the mother liquor is recycled to the precipitation plant.	The dry AMV is fed to the Modified Vanadium Oxide (MVO) reactors and converted to vanadium trioxide in two electrically heated rotary reducing furnaces. The off gases pass through a baghouse and a wet scrubber before being discharged to atmosphere.
Ferrovanadium	

Historically the company produced ferrovanadium (DeV) in an electric arc-furnace. The furnace is, however, currently mothballed. FeV was historically produced batch-wise in the electric arc furnace by heating a portion of the MVO produced by aluminum metal and calcium oxide. The furnace is equipped with a bag filter to capture dust emissions emanating from the process.
Mix plant
The remaining portion of MVO product is fed to the mixing plant, mixed with carbon, starch, and binder to produce briquettes. The briquettes are dried in an electrically operated dryer before being fed to the Nitrovan furnaces. The process has been improved to keep the air in a closed circuit, thus not emitting to the atmosphere as had been the case with the improvement. No air pollution control equipment is therefore used in this process.
Nitrovan furnaces (Refining)
Dried MVO briquettes are fed to the four Nitrovan furnaces, which produce vanadium carbonitride (Nitrovan). Each furnace is equipped with a cyclone as APCE.
Packaging and shipping
Nitrovan product is packaged and shipped to customers

4.2 SOLID WASTE (DOMESTIC, INDUSTRIAL AND HAZARDOUS)

Waste is collected from the mine by a registered water Contractor and disposed of accordingly. Vametco disposes of their **domestic waste** at Madibeng Local Municipality's domestic waste handling facility.

Industrial waste is contained in steel skips or bins and removed by a licensed contractor and disposed of in a licensed industrial waste disposal site located off the mine's property. As the mine expands, the new activities will be incorporated into the waste management strategy that is currently in place.

Hazardous waste is twofold, i.e., mineral waste and lab-related waste. Other hazardous waste types are disposed of accordingly at a licensed facility.

Table 7: Mineral Waste in Vametco

Mineral Waste Type	
Solid	• Calcine/magnetite dump, • Sand Tailings • Waste Rock Dump (WRD)
Liquid	• Pollution Control Dams (PCDs) (Toe drains, dirty water, leachate interception drains) • Barren and scrubber solutions, • RWD.

4.3 DIESEL, OIL AND PETROL STORAGE

The are 2 x 23 000 litres diesel tanks at the mine. The following oil and petrol tanks are stored in the mine:

Table 8: Oil and Petrol Tanks

Type	Storage Type	Quantity
Heavy fuel oil at precipitation plant	Aboveground	40 000 litres
Petrol	Underground	14 000 litres
Burner fuel oil at Kiln		80 000 litres

Table 9: Summary of the 2021 authorised activities and associated aspects

Activity	Waste stream / material	Size	Capacity	Location	Waste Classification	Type of waste	Landfill category
Expansion of magnetite dump	Magnetite waste	17ha and 5ha	-	North and south of the existing dump	Hazardous	Type 2	Class B (GLB+)
Expansion of TSF	slimes waste	85 ha	-	East of the existing TSF	Non-Hazardous	Type 3	Class C (GLB+)
Development of the Overburden dump	Waste rock	24ha	-	North east of the mine	Hazardous	Type 3	Class C (GLB+)
The existing scrubber dam	Scrubber solutions	-		West of the mine next to the plant	Unclassified	Type 0	Landfill Disposal Prohibited
Development of Barren dam	Barren solutions	3ha	105 000m^3	South west of the mine n	Unclassified	Type 0	Landfill Disposal Prohibited
Development of PCD 1	To service the magnetite dump	±2.65 (ha)		West of the mine next to the plant	Unclassified	Unidentified	Unidentified
Development of PCD 2	To service the plant	3ha	92750m^3	North of the existing TSF	Unclassified	Unidentified	Unidentified
Development of RWD	Stormwater	5ha	225 000m^3	East of the mine adjacent to the	Unclassified	Unidentified	Unidentified

				proposed TSF expansion.			

4.4 WATER MANAGEMENT AND SUPPLY (CLEAN AND DIRTY WATER AND STORM WATER PROCESSES)

4.4.1 Pollution Control Dam

There are two Pollution Control Dams (PCD) on-site that are lined to capture all water emanating from different areas. Two additional PCDs will be developed to store polluted water from the magnetite dump, which is 3 ha with a capacity of 92750 m^3 and contain the contaminated and dirty water from the plant runoff, which is 1ha with the 73500 m^3. The total capacity of the 2 PCDs will be 166 250 m^3.

4.4.2 Construction of return water dam

A Return Water Dam will be constructed to accommodate polluted water from the slimes dam. The dam will cover approximately 5 ha and will have a capacity of 225 000 m^3.

4.4.3 Process Water Supply and Management

The water use strategy is based on prioritisation of dirty water for use at the plant and dust suppression. Dirty water for the plant is sourced from the following via pollution control dams:

- Decant water from the magnetite dump channeled via dirty water drains into the pollution control dams.
- Rainwater falling into the dirty water areas and diverted to the pollution control dams.
- Decant water from the oil traps pumped via dirty water systems to the pollution control dams.
- Seepage water intercepted via the seepage drain into the sump and then pumped into the v-drain and then to the pollution control dams.

4.4.4 Clean and Dirty Water and Storm Water Processes

The Vametco operations follow all guidelines according to Government Notice 704. Government Notice No. 704, published in terms of the National Water Act (Act No. 36 of 1998), for existing and proposed activities, i.e., stormwater dam. The act requires the following and will be adhered to for all purposes at the Vametco operation:

- All clean water systems must be designed and operated in such a manner that they are always capable of handling the 1:50 year flood event on top of their mean operation level without spilling;
- Any water arising from an area which causes, has caused, or is likely to cause pollution of a water resource, including polluted stormwater, must be contained within a dirty water system. Contaminated areas must be minimised to reduce the volume of polluted water. While clean water must be diverted to natural watercourses, polluted water should be re-used wherever possible, thereby reducing the use of clean water; and

- Design, construct, maintain and operate any dam or magnetite facility that forms part of a dirty water system to have a minimum freeboard of 0.8m above the full supply level.

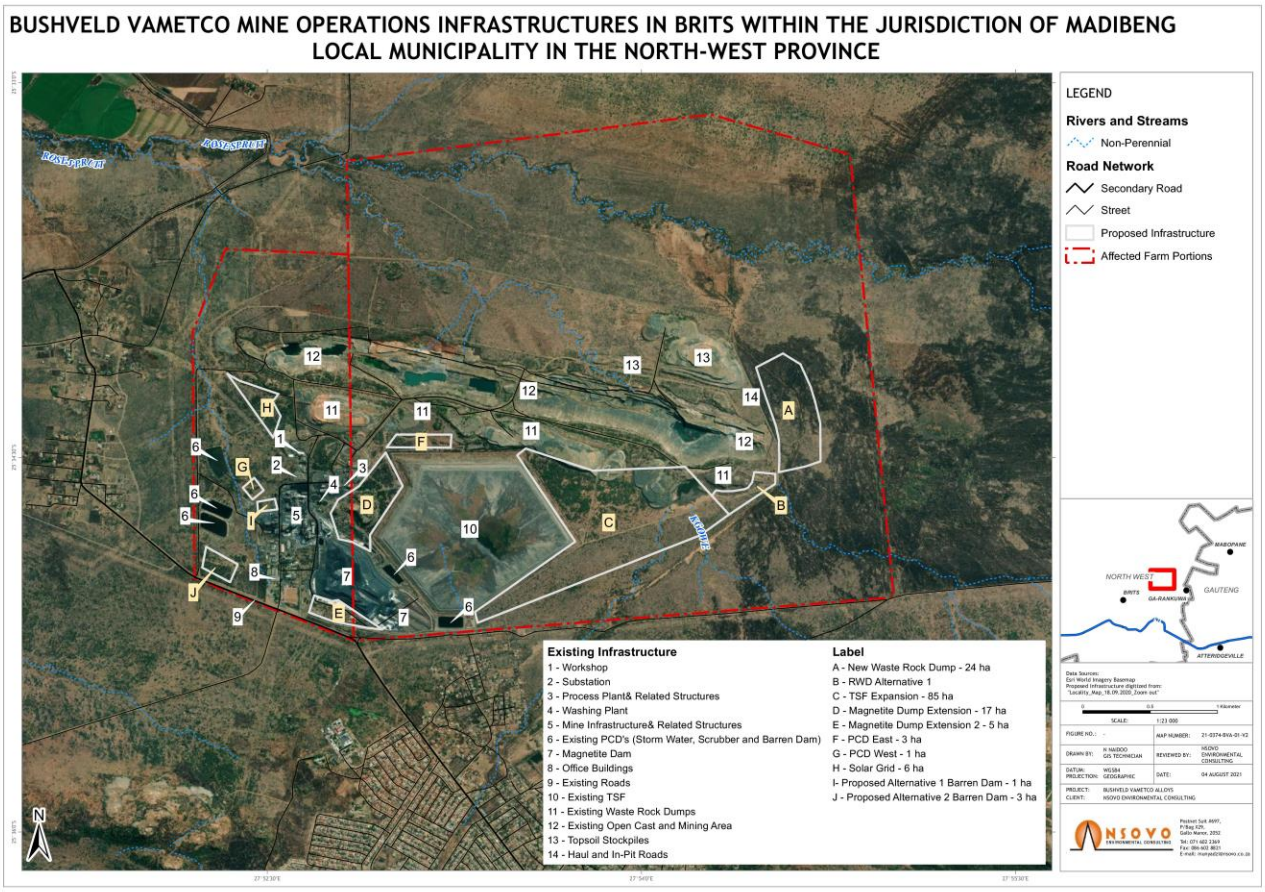

Figure 2: The existing infrastructures within Bushveld Vametco

The Table 10 below presents the authorised activities as per approved EMPr of 1999 and 2021 it also shows the proposed activities as part of the EA amendment process.

Table 10: The authorized and proposed activities at Vametco mine

Approved activities and infrastructures					
Approved Environmental Management Programme (EMPr) by Department of Mineral Resources and Energy					
Date of Approval	**26 February 1999**		**Date of Approval**	2021	
Tailings dam			Expansion of the existing tailings dam		
Old waste rock dump			Development of a new Waste Rock Dump		
Magnetite dump			Expansion of the existing magnetite dump		
Topsoil dump			Construction of two Pollution Control Dams (PCDs		
Scrubber sludge dams			Development of one new ±5ha Return Water Dam (RWD)		
Open pit			Construction of a barren dam		
Plant area, workshop, and offices					
Date of Approval	**10th of October 2022**				
3.5 MW AC Solar PV Plant and 1MW/4 MWh Vanadium Redox Flow battery (VRFB) storage system.					
National Environmental management: Air Quality Act (NEM:AQ)			**National Environmental Waste Management: Act (NEMWA)**		
Date of approval	26 February 1999	Approved by Bojanala Platinum District Municipality	Date of Approval	9th March 2016	Approved by the Department of Forestry, Fisheries, and the Environment
Concentration plant			Expansion of the Magnetite dump		
Extraction (Rotary Kiln, Leach, and precipitation sections)			Pollution Control Dam		

Sulphate Recovery Plant			
MVO Production Plant			
Ferrovanadium plant			
Mix plant			
Nitrovan Furnaces			
Boiler and rendering operations			
Packaging and shipping activities			
National Water Act (NWA)			
Date of approval	31 May 2017	Approved by Department of Human Settlement Water and Sanitation (DHSWS)	
Tailings dam			
Old waste rock dump			
Magnetite dump			
Topsoil dump			
Scrubber sludge dams			
Open pit			
Pollution Control Dam			
Boreholes			
Proposed activities			
Environmental Management Programme (EMPr) by Department of Mineral Resources and Energy			

400MW Solar PV Park and associated infrastructures.	

The table below includes new listed activities that are currently being applied under the 2014 EIA Regulation for and form part of the amendment.

Table 11: Listed and specified activities already authorised and those being included in the amendment.

Regulation	Listed Activity	Description
Authorised Activities		
GN R. 983 April 2017 Activity 12:	*"The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square meters; or* *(ii) infrastructure or structures with a physical footprint of 100 square meters or more;* *where such development occurs—* *a) in front of a development setback; or* *if no development setback exists, within 32 meters of a watercourse, measured from the edge of a watercourse".*	The proposed development entails the following: • Development of two PCDs to contain and manage contaminated water from the magnetite dump facility and the plant. The PCD for the magnetite dump will be approximately 5ha and for the plant will approximately 3ha. • Development of a Return Water Dam (5ha) to accommodate wastewater from the slimes dam or TSF. • Development of a barren dam to store barren and mother liquor solution (dam to store the excess of 100 000m^3). • Development of a new WRD to reduce load and haul distance and to facilitate easy backfill.
GN R. 983 April 2017 Activity 27:	*"The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—* *(i) the undertaking of a linear activity; or*	Approximately 10ha of indigenous vegetation will be cleared to provide space for the construction of the RWD, PCDs, and barren dam.

Regulation	Listed Activity	Description
Authorised Activities		
	(ii) maintenance purposes undertaken following a maintenance management plan".	
GN R. 983 April 2017 Activity 48:	*"The expansion of-* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs-* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse".*	The proposed project entails the expansion of the following infrastructure or structures: • The existing slimes dam will be expanded by 85ha to cater to additional slimes waste capacity towards the east. • The existing magnetite dump by approximately 17ha to the north and 5ha to the south of the mine.
GN R. 984 April 2017 Activity 15:	*"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for—* *(i) the undertaking of a linear activity; or*	The proposed slimes dam expansion will require vegetation clearance of approximately 85ha on the eastern side of the mine to cater for additional slimes wastes capacity.

Regulation	Listed Activity	Description
Authorised Activities		
	(ii) maintenance purposes undertaken in accordance with a maintenance management plan".	
GN R. 985 April 2017 Activity 14:	*"The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more.* *where such development occurs—* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.* **h. Northwest** iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; v. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority".	The proposed project entails the development of two PCDs, one RWD and barren dam with a combined physical footprint of more than 10 square metres within a wetland and other sensitive areas.

Regulation	Listed Activity	Description
Authorised Activities		
Authorised Waste Management Licence Activities		
GN R921 of November 2013: Category B, Activity 7	*The disposal of any quantity of hazardous waste to land*	The existing magnetite dump and slimes dam will be expanded to cater for the disposal of magnetite and slimes waste.
GN R 921 of November 2013: NEM:WA Category B, Activity 10	*The construction of facilities for a waste management activity listed in Category B of this schedule (not in isolation to associated activity*	The following waste management facilities will be constructed: • Two PCDs to accommodate stormwater and return water from the magnetite dump. • A return water dam to accommodate stormwater and return water from the existing and proposed slimes dam. Barren dam to store barren and mother liquor solution.
Water Use Licence activities		
Section 21 (g)	*Disposing of waste in a manner which may detrimentally impact on a water resource*	The following activities will trigger S21(g): • Expansion of the existing slimes dam • Expansion of the existing magnetite dump • Construction of two Pollution Control Dams (PCDs) • Development of one new ±5ha Return Water Dam (RWD) to accommodate return/polluted water from the proposed and existing slimes dams as well as to accommodate stormwater within the mine. • Construction of a barren dam • Development of a new Waste Rock Dump

Regulation	Listed Activity	Description
Authorised Activities		
Section (c) & (i)	*Impeding or diverting the flow of water in a watercourse.* *Altering the bed, banks, courses or characteristics of a watercourse.*	The proposed Solar Park will encroach on the identified channelled valley bottom wetland.
Proposed activities		
Regulation 31 of the EIA Regulations	*"An environmental authorisation may be amended by following the process prescribed in this Part if the amendment will result in a change to the scope of a valid environmental authorisation where such change will result in an increased level or change in impact where such level or change in nature of impact was not—* *a) assessed and included in the initial application for environmental authorisation; or* *b) taken into consideration in the initial environmental authorisation;* *and the change does not, on its own, constitute a listed or specified activity."*	Vametco proposed to develop a 400 MW Solar PV

5 A MAP AT AN APPROPRIATE SCALE WHICH SUPERIMPOSES THE PROPOSED ACTIVITY, ITS ASSOCIATED STRUCTURES, AND INFRASTRUCTURE ON THE ENVIRONMENTAL SENSITIVITIES OF THE PREFERRED SITE, INDICATING ANY AREAS THAT SHOULD BE AVOIDED, INCLUDING BUFFERS

Based on the baseline environment of the proposed Mining Right Area's, sensitivity mapping has been undertaken to identify areas of sensitivity and create both regulated and non-regulated buffers to protect such areas. The sensitivity map below (Figure 3) and attached as Appendix A focuses on the proposed activities that must still be authorised. Table 12 below provides a summary of Sensitive Areas within and around the mining area and Buffers Created.

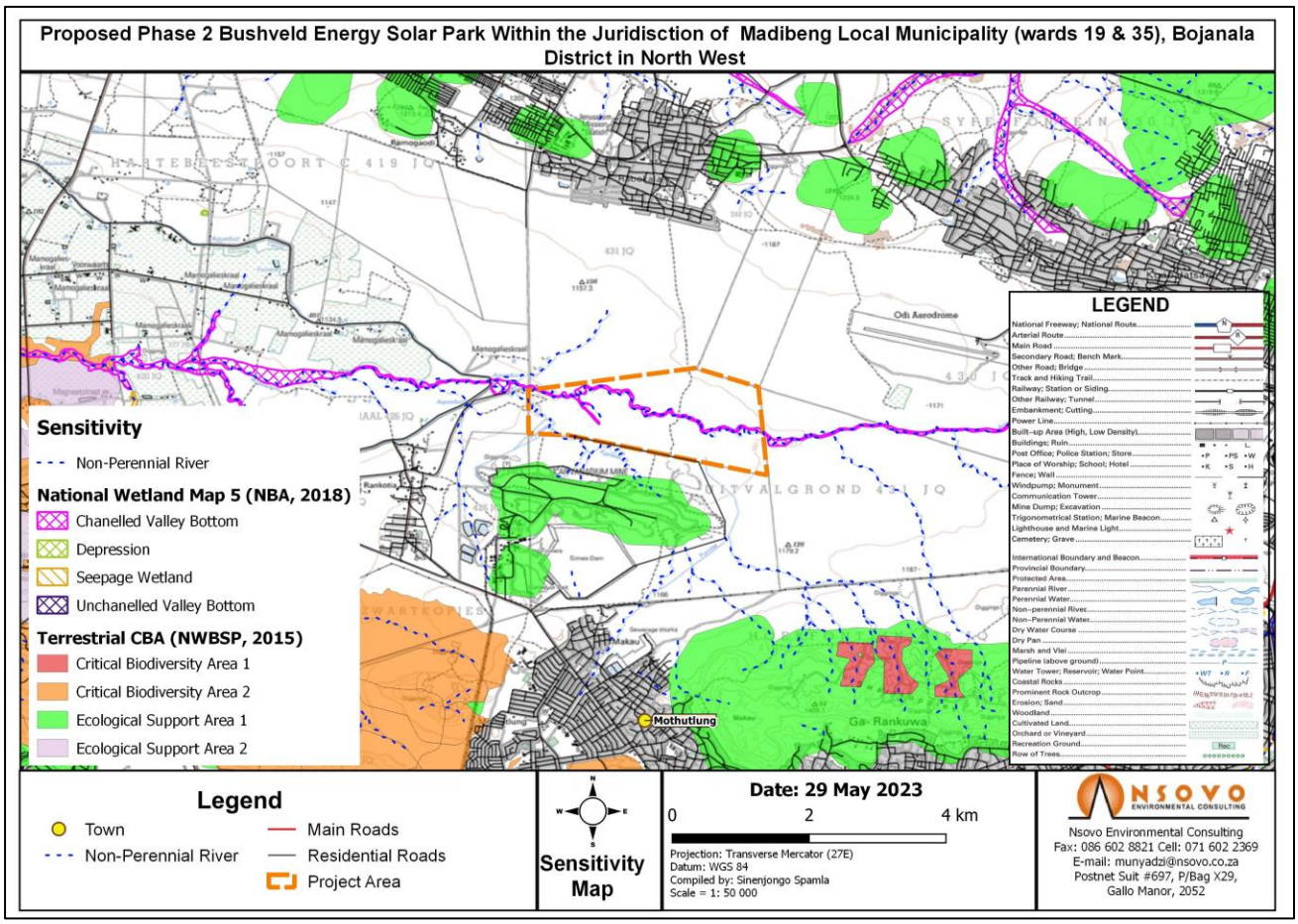

Figure 3 : Sensitivity Map – Proposed Activities

Table 12: Summary of Sensitive Areas within and around the mining area and Buffers Created

Aspect	Description	Proposed Buffers (Legislated and non-legislated)
Terrestrial Critical Biodiversity Area (CBA)	There are no critical biodiversity areas within the Vametco mine.	None
Terrestrial Ecological Support Area	It covers approximately 75% of the mine.	None
Aquatic CBA	There is no aquatic CBA.	None
Aquatic Ecological Support Area (ESA)	ESA 1 and 2 scattered across the site.	None
Conservation Protected Areas	There are no conservation areas identified near the mine.	Not applicable.
ECA	None within the mining area.	Not applicable.
Ecological Corridor	There is no ecological corridor on site.	None
Sensitive Flora	There is Marikana Thornveld located within and around the vicinity of the mine.	None
NFEPA Rivers	None of the rivers within the mining rights area are classified as NFEPA rivers.	Not applicable
Wetlands	• There are artificial wetlands within the site boundary and NFEPA wetlands. • A channel valley bottom wetland exists within the proposed project area for the Solar Park.	No buffers
Soil Potential	There are soils of intermediate suitability for arable agriculture where climate permits.	Not applicable
Archaeological Sites	• There are approximately 30 formal graves with tombstones were recorded at the site proposed for the tailings dam. These graves will be directly affected by the proposed development (both expansion and the new Return Water Dam). • No graves were found at the site proposed for the Solar Park.	Relocation of the graves before commencement with construction.

6 A DESCRIPTION OF THE IMPACT MANAGEMENT OUTCOMES, INCLUDING MANAGEMENT STATEMENTS, IDENTIFYING THE IMPACTS AND RISKS THAT NEED TO BE AVOIDED, MANAGED AND MITIGATED AS IDENTIFIED THROUGH THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FOR ALL PHASES IMPACT MANAGEMENT OUTCOMES

6.1 IDENTIFIED RISKS THAT NEED TO BE AVOIDED

Table 13 Table 14, 15, and
Table 16 below identified the Risk that needs to be avoided and throughout the project phases (construction, operation, and decommissioning phases). The risk identification was guided by the specialist studies undertaken and are summarized as follows:

6.1.1 CONSTRUCTION PHASE

Table 13: Impacts Identified for Construction

Hazards/Threat	Risk Identified
Construction Activities	
Movement of construction personnel	• Impact on sensitive environments • Trespassing • Safety and security
Site preparation and excavations	• Loss of topsoil • Irreparable damage to plant species (biodiversity) • Possible destruction of unidentified heritage resources • Possible disturbance or destruction of sensitive environments such as wetlands • Indefinite stoppage of agricultural activities within the immediate construction footprint • Removal of wetland recharge soils • Increase in soil erosion. • Contamination of Soil • Disturbance of fauna • Damage to flora • Surface Water Consumption • Groundwater Contamination

Hazards/Threat	Risk Identified
	○ Generation of Dust ○ Generation of Smoke ○ Generation of waste ○ Destruction of Graves and archaeological sites
Vehicle movement and refueling activities	• Damage to protected /endangered vegetation. • Damage to sensitive areas. • Erosion and loss of topsoil. • Generation of Dust. • Destruction of sites of archaeological and heritage significance. • Contamination of Soil. • Could result in fuel spillages that could potentially contaminate ground and surface water resources.
Change in Land Use	• Loss of agriculture value due to changes in land use. • Alteration (both physical to hydropedological flow paths, leading to degradation of wetland and chemical status) and pollution of soil forms by construction activities associated wetland recharge soils. • Loss of biodiversity puts aspects of the economy, wellbeing, and quality of life at risk, and reduces socioeconomic options for future generations. • Shallow, light textured soil of low clay content, as well as soils located on higher landscape positions more prone to erosion risk.
Drainage lines	• Water resources contamination. • Impact on drainage lines in the vicinity of the proposed magnetite dump and TSF expansion. • The high negative impacts associated with the conveyor belt running along drainage lines.

6.1.2 OPERATIONAL PHASE

Table 14: Risks Identified for the Operational Phase

Aspect	Impact
Climate Change	**Increased temperature** • Increased temperature, heatwaves and wildfires can pose a health risk to employees; may impact productivity; may present a risk of spontaneous combustion of coal stockpiles. • Wildfires may damage infrastructure and facilities. **Reduced rainfall** • Water scarcity and drought can constrain exploration, processing, and site rehabilitation; can lead to water conflicts with communities; may further exacerbate water quality. • Drought may result in increased dust generation and increased water requirements for dust suppression and cleaning of solar panels. **Extreme events** • Floods, cyclones, and storms may cause the following: o Damage to infrastructure and facilities; o Discharge of contaminated water into surrounding areas; and o Reduced accessibility due to flooding of roads. **Wind Impacts** • High wind speeds and gusts may damage infrastructure; may result in increased dust generation.
Metallurgical Processes	• Could result in fuel spillages that could potentially contaminate ground and surface water resources. • Alteration (both physical and chemical status) and pollution of soil forms by mining operations. • Ongoing disturbances to soils, resulting in increased leaching of soil nutrients and risk of erosion, attributed to mining activities. • Increase in Soil erosion.

Aspect	Impact
	• Contamination of Soil • Loss of Soil Structure Fertility • Surface Water Contamination • Groundwater Contamination • Generation of Dust
Open Cast Mining	• Noise • Dust • Ground vibration during blasting and machine movements
Load and hauling	• Waste rock dust generation
Fire	• Safety risk • Loss of assets
Storage of Hazardous Material	• Ground and surface water contamination
Gas and Dust explosions	• Health and safety risk. • Can lead to fatal accidents. • Air pollution
Magnetite dump, tailings dam, waste rock dam instability	• Risk of failure. • Health and safety risk. • Can lead to fatal accidents. • Dirty runoff from the magnetite and TSF. • Exposure of soil surface and ineffective rehabilitation. • Disturbance of current magnetite dump could cause instability resulting in more seepage to surface water resource. • Surface Water pollution. • Groundwater pollution.
Toxic contaminants	• Explosions from gases such as methane can pose considerable health and safety risks including loss of lives.

Aspect	Impact
Maintenance	• Noise Impact • Ground and surface water contamination

6.1.3 DECOMISSIONING AND REHABILITATION

A detailed risk assessment was undertaken to determine both financial and environmental risks during this phase. The Table below shows the risk identified.

Table 15: Risks Identified for the Decommissioning and Rehabilitation Phases

Aspect	Impact
Magnetite dump Facilities	
Slope failure	• Collapse of the slope due to the inadequate engineering designs or natural causes
Alien invasive plants	• Encroachment of alien invasive plants
Erosion cover	• Inadequate cover material for the Magnetite dump Facility • Ineffective rehabilitation may lead to further loosening and detachment of soil particles and risk of erosion
Seepage and Leachate drainage	• Excessive water infiltration/preferential flow paths leading to excessive seepage. • Leachate from Magnetite dump Facility to ground and surface water sources
Dust	• Dispersion of dust particles from the Magnetite dump Facilities.
Building Infrastructures	
Failure to remediate contaminated soil	• Failure to remediate soil contamination and/or avoid weed infestation along the conveyors and the loading bay/siding and storage facilities for hazardous substances. • Failure to remove all/some of the fuel storage and dispensing facilities
Water Facilities	

Aspect	Impact
Floods and earth tremors	• Damage to PCDs, Barren Dam and RWDs from floods and earth tremors.
Building fire	• Destruction of building and equipment by fire.
Improper removal of the materials in PCDs, RWDs and silt traps	• PCDs and RWDs will be the last to be removed, if not removed properly there could be a possibility of soil contamination from materials in the PCD and RWD.
Seepage	• Leachate from PCD to ground and surface water sources
Dam wall failure or Overflow	• Overflow of PCD material
Climate change	• Floods, cyclones, and storms that may cause damage to infrastructure and facilities and floods, cyclones and storms that may cause reduced accessibility due to flooding of roads.
Plant Area	
Alien invasive plants	• Encroachment of alien invasive plants.
Soil and water contamination	• Failure to decontaminate materials / equipment being used elsewhere, leakage or spill of contaminated material.
Waste Management	• Leakages and spills of hazardous substances.
Visual amenity	• Failure to remove all the plant and facility structures.
Soil disturbance	• Soil erosion where the plant was located
Stormwater Management	• Stormwater runoff which erodes the ore and waste stockpiles
Legal, Financial and Reputational Risks	
Change of legislations	• Vametco incurring additional costs because of changing legislative requirements.

Aspect	Impact
Failure to demonstrate relinquishment criteria	• Vametco failing to demonstrate that the relinquishment criteria have been achieved.
Withdrawal of planned 3rd party maintenance on infrastructure (Offices and Workshops)	• The withdrawal of planned maintenance on any structures that are left for 3rd party post closure use, may result in the integrity of the structures deteriorating to the point where they represent a Health and Safety risk to users, if the 3rd party does not implement its own maintenance regime.
Omission of environmental impacts	• Unidentified environmental impacts are not mitigated because of closure actions that are not planned
Closure delay	• Closure delay once life of mine is reached with a concurrent reduction in personnel to secure the footprint
Underestimation of closure costs	• Underestimation of closure quantum resulting in inadequate funds being set aside for rehabilitation
Failure to adhere to final land-use plan	• Financial and reputational risk.
Insufficient baseline information	• Lack of sufficient baseline information collected during operations to underpin closure-related performance.
Improper closure planning	• Lack of focused, coordinated closure planning, as well as possible failure of implementation of closure and rehabilitation measures due to lack of official, dedicated closure 'champion'
Failure to consider decommissioning and closure legal requirements such as registration of contaminated land and environmental authorisations	• The site that is contaminated with hazardous substances triggers registration under the National Waste Act and the decommissioning activities require environmental authorisations. Triggering legislative actions due to soil contamination which falls under S8 of Chapter 4 of NEMWA.

6.2 IMPACT MANAGEMENT OUTCOMES

Table 16 below outline the range of approaches to be undertaken to manage the potential environmental impacts / risk of the project activities throughout the project cycle.

Table 16: Approach to Impact Management

Impact Management	Description
Avoidance	Avoiding activities that could result in adverse impacts and/or resources or areas considered sensitive.
Prevention	Preventing the occurrence of negative environmental impacts and/or preventing such an occurrence having negative impacts.
Preservation	Preventing any future actions that might adversely affect an environmental resource.
Minimisation	Limiting or reducing the degree, extent, magnitude, or duration of adverse impacts
Mitigation	Measures taken to minimise adverse impacts on the environment.
Enhancement	Magnifying and/or improving the positive effects or benefits of a project.
Rehabilitation	Repairing affected resources, such as natural habitats or water resources.
Restoration	Restoring affected resources to an earlier (possibly more stable and productive) state, typically 'background' or 'pristine' condition. These resources may include soils and biodiversity.
Compensation	Compensating for lost resources, and where possible, the creation, enhancement, or protection of the same type of resource at another suitable and acceptable location.

Following a detailed description of the impact management approaches, this section provides a describes the management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed, and mitigated throughout all phases.

6.2.1 Pre-Construction Phase

Table 17: Pre-construction Objectives

Aspect	Objective
Social	• To increase local employment. • To reduce the impacts on local cultural sense of place. • To minimise social pathogens and unhealthy behavior. • Protection of archaeological, historical and any other site or land considered being of cultural value.
Soil	• To prevent erosion, sedimentation, surface water contamination and reduction in water quality. • To minimise land use alternation and soil erosion.
Biodiversity	• To ensure adequate planning to prevent habitat destruction. • To prevent a significant increase in alien invasive species abundance and spread and to prevent habitat fragmentation with specific reference to the proposed activities. • To conserve species of conservational concern and reduce impacts arising from insufficient rehabilitation. • To minimise the impact on plants of conservation concern through implementation of Search and rescue according to the plan.
Sensitive Environments	• To prevent the destruction of wetland habitats and conserve the biological structure of wetlands.

6.3 CONSTRUCTION PHASE

Table 18: Construction Objectives

Aspect	Objective
Social	• To protect the socio-economic environment for locals. • To improve the local economy through utilisation of local resources. • To prevent the destruction of graves. • To conserve heritage artifacts and buildings. • To minimise impacts on infrastructure and land occupiers during blasting activities.
Water	• To prevent groundwater contamination. • To protect surface water flow, water quality, and associated pollution. • To conserve water usage during construction. • To ensure adequate clean and dirty water separation.

Aspect	Objective
	• To prevent sedimentation of local streams because of erosion.
Air Quality	• To minimise emissions to the atmosphere affecting employees, locals, and climate change impacts. • To reduce greenhouse gas emissions.
Soil	• To prevent soil contamination and ensure rehabilitation of contamination. • To minimise loss of land capability and enhance rehabilitation.
Biodiversity	• To prevent a significant increase in alien invasive species abundance and spread. • To minimise the loss of floral habitat. • To minimise loss of floral biodiversity. • To protect floral habitats and diversity. • To reduce the impacts on faunal ecological integrity through curbing erosion and poaching. • To minimise cumulative loss of natural vegetation in the region.
Sensitive Environments	• To protect Wetland Habitat and wetland ecological structure. • To protect hydrological functioning of the wetland systems.

6.4 OPERATIONAL PHASE

Table 19: Operation Objectives

Aspect	Objective
Social	• Improve the local financial capital for local communities and landowners. • Protect the socio – economic environment of locals. • Prevent negative social impacts on the health and safety of land users and employees. • Prevent destruction of graves.
Water	• Prevent groundwater contamination. • Protect surface water flow, water quality, and associated pollution. • Ensure effective and reliable clean and dirty water separation. • Prevent water wastage and impact on water resources. • Prevent siltation of watercourses.
Air Quality	• To minimize atmospheric pollution. • Reduce Greenhouse gas emissions.
Soil	• Prevent soil contamination and ensure rehabilitation of contamination.

Aspect	Objective
	• Minimise loss of soil resources. • Minimise loss of agricultural land. • Prevent soil sterilization and contamination. • To reduce soil pollution and degradation. • To minimise sediment movement offsite. • To prevent compaction of soils on site.
Biodiversity	• To prevent a significant increase in alien invasive species abundance and spread. • To protect floral habitats and diversity.
Hydrogeology	• To prevent acid mine drainage generation. • To avoid the deterioration of water resources due to acid mine drainage. • To avoid seepage of leachate into underlying strata.
Sensitive Environment	• To protect wetland habitat and wetland ecological structure. • To minimise change and effectiveness of wetland service provision. • To protect hydrological functioning of the wetland systems. • To prevent alteration of natural ecological processes and ecosystem functioning. • To prevent changing the quantity and fluctuation properties of watercourses. • To reduce the amount of sediment entering water resource and the associated change in turbidity • To avoid alteration of water quality toxic contaminants, including toxic metal ions and hydrocarbons. • To avoid changing the physical structure within a water resource. • To reduce ecological impacts and ecosystem functioning. • To prevent the spread of alien invasive species.
Climate Change	• To communicate and implement an effective nationally determined climate change response strategy. • To prevent increased temperature and wildfires due to climate change. • To avoid depletion of water resources resulting from drought. • To minimize the occurrence of floods, cyclones, and storms. • To minimize damage if infrastructure caused by floods, cyclones, and storms. • To minimize impact caused by high wind speeds and gusts.

6.5 REHABILITATION AND CLOSURE

Table 20: Rehabilitation and Closure Objectives

Aspect	Objective
Social	• To implement closure actions to reduce closure risks to the planned residual risk timeously. • To decommission all surface infrastructure that has no beneficial post-closure use. • To identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding landowners and land users and then rehabilitate disturbed land to a suitable state for its post-closure uses. • To rehabilitate disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines). • To reduce the visual impact of the site through rehabilitation of all disturbed land.
Water	• To implement water management measures to limit the potential impact decant has on receiving water bodies. • To promote the separation of dirty from clean water. • To avoid groundwater reduction and contamination from leachates. • To prevent water contamination and pollution.
Soil	• To ensure rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage. • To rehabilitate all disturbed land to a state where post-closure management is minimised. • To reduce soil pollution and degradation. • To minimise sediment movement offsite. • To prevent soil contamination. • To promote revegetation on site.
Air Quality	• To reduce noise pollution from decommissioning activities. • To prevent windblown dust from transportation. • To reduce noise generated by decommissioning activities. • To minimise fugitive dust emissions and related impact.
Hydrogeology	• To prevent acid mine drainage migration. • To prevent deterioration of water resources due to acid mine drainage. • To avoid seepage of leachate into underlying strata to manage decant water.

Aspect	Objective
Sensitive Environment	• To reduce the amount of sediment entering water resource and associated change in turbidity. • To reduce the ecological impacts and ecosystem functioning. • To prevent the spread of alien invasive species. • To prevent disturbances on wetlands.
Climate Change	• To implement an effective nationally determined climate change response strategy. • To avoid depletion of water resources resulting from drought. • To minimize damage if infrastructure caused by floods, cyclones, and storms. • To reduce the impact caused by high wind speeds and gusts.
Social	• To prevent the decreasing resale value of farms. • To improve the visual aesthetics. • To avoid the loss of employment.
Traffic	• To reduce traffic, build up, and noise generation.

7 LEGISLATE FRAMEWORK

This section lists and describes the acts and legislation relevant to the proposed project and associated infrastructure. A list of the current South African environmental law pertinent to the proposed development is described in below Table 21.

Municipal policies, plans, and by-laws, Vametco's policies, and world best practices; were considered during the undertaking of the EIA process. The below describes legislations that apply to the project; it is not an exhaustive analysis; however, it provides a guideline to the relevant aspects of each legislation.

Table 21 : Legislation pertaining to the proposed project.

Aspect	Relevant Legislation	Brief Description
Environment	National Environmental Management: Act 1998, (Act No. 107 of 1998) as amended. Environmental Impact Assessment Regulations, December 2014 as amended	The overarching principles of sound environmental responsibility as reflected in the National Environmental Management Act, 1998 (Act No. 107 of 1998) apply to all listed projects. Construction and operation of activities must be conducted in line with the generally accepted principles of sustainable development, integrating social, economic, and environmental factors. The EIA process followed complies with the NEMA and the EIA Regulations of December 2014 as amended. The proposed development involves "listed activities," as defined by NEMA. Listed activities are activities that may potentially have detrimental impacts on the environment and therefore require an EA from the relevant Competent Authority, in this case, DMRE.
Mining Rights	The Mine Health and Safety Act, 1996 (Act No. 29 of 1996)	The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA) aims to provide for the protection of the health and safety of all employees and other personnel at the mines. The main objectives of the act are: • Protection of the health and safety of all persons; • Requires employers and employees to identify hazards and eliminate, control, and minimise the risks relating to health and safety at the mines; • Gives effect to the public international law obligations of the Republic that concern health and safety at all mines; • Provides for employee participation in matters of health and safety through health and safety representatives and the health and safety committees at the mines; • Provides for effective monitoring of health and safety conditions at the mines; • Provides for enforcement of health and safety measures at the mines; • Provides for investigations and inquiries to improve health and safety at mines; and

Aspect	Relevant Legislation	Brief Description
		• To promote: ○ Culture of health and safety in the mining industry; ○ Training in health and safety in the mining industry; and ○ Co-operation and consultation on health and safety between the State, employers, employees, and their representatives.
Biodiversity	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The purpose of the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.
Protected Areas	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)	The purpose of this Act is to provide for the protection, conservation, and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.
Heritage Resources	National Heritage Resources Act, 1999 (Act No. 25 of 1999)	The National Heritage Resources Act, 1999 (Act No. 25 of 1999) legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 ha. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits for this specific project will be administered by the Northwest Heritage Agency or the South African Heritage Resources Agency (SAHRA).
Air quality management and control	National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)	The objective of the Act is to protect the environment by providing reasonable measures for the protection and enhancement of air quality and to prevent air pollution. The Act makes provision for measures to control dust, noise, and offensive odours.

Aspect	Relevant Legislation	Brief Description
		Section 32 of The National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) deals with dust control measures regarding dust control. The Minister or MEC may prescribe measures for controlling dust in specified places or areas, either in general or by specified machinery or in specified instances, the steps to be taken to prevent nuisance or other measures aimed at the control of dust. The National Dust Control Regulations (2013) provides for the management and monitoring of dust.
Noise Management and Control	Noise Control Regulations in terms of the Environmental Conservation, 1989 (Act 73 of 1989)	The assessment of impacts relating to noise pollution management and control, where appropriate, must form part of the EMPr. Applicable laws regarding noise management and control refer to the National Noise Control Regulations issued in terms of the Environment Conservation, 1989 (Act 73 of 1989).
Water Resources Management	National Water Act, 1998 (Act 36 of 1998)	This Act provides for fundamental reform of the law relating to water resources and use. The preamble to the Act recognises that water resource management aims to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure the sustainability of the nation's water resources in the interests of all water users. The proposed Solar Park will encroach a Channelled valley bottom Wetland, therefore a Water Use Licence Application will be submitted to DWS.
Agricultural Resources	Conservation of Agricultural Resources *Act, 1983 (Act No. 43 of 1983)*	The Act aims to provide for control over the utilization of natural agricultural resources to promote the conservation of the soil, water resources and vegetation and to combat weeds and invader plants. Section 6 of the Act makes provision for control measures to be applied to achieve the objectives of the Act.

Aspect	Relevant Legislation	Brief Description
Human	The Constitution of South Africa, 1996 (Act No. 108 of 1996	The Constitution provides for an environmental right (section 24). The State is obliged "to respect, protect, promote and fulfil the social, economic and environmental rights of everyone…" The environmental right states that: "Everyone has the right - a) To an environment that is not harmful to their health or well-being; and b) To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that - • Prevent pollution and ecological degradation; • Promote conservation; and • Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."
Waste	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)	This Act provides fundamental reform of the law regulating waste management to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development. This Act also ensures the provision of national norms and standards for regulating the management of waste by all spheres of government. Furthermore, it provides for specific waste management measures; licensing and control of waste management activities; remediation of contaminated land; compliance and enforcement; and for matters connected therewith. The proposed project entails the expansion and operation of the proposed magnetite dump facility and slimes dam facilities for the disposal of magnetite and slimes wastes.

Aspect	Relevant Legislation	Brief Description
Minerals and petroleum resources	Mineral and Petroleum Resources Development Act, 2002 (28 of 2002)	The objects of this Act are to – (a) recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic; (b) give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources; (c) promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa; (d) substantially and meaningfully expand opportunities for historically disadvantaged persons, including women and communities, to enter and actively participate in the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources; (e) promote economic growth and mineral and petroleum resources development in the Republic, particularly the development of downstream industries through the provision of feedstock, and development of mining and petroleum inputs industries; (f) promote employment and advance the social and economic welfare of all South Africans; (g) provide for security of tenure in respect of prospecting, exploration, mining, and production operations; (h) give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and (i) Ensure that holders of mining and production rights contribute towards the socioeconomic development of the areas in which they are operating.
Hazardous Chemicals	Hazardous Substances Act (Act 15 of 1973)	The Hazardous Substances Act controls the production, import, use, handling, and disposal of hazardous substances. Under the Act, hazardous substances are defined as substances that are toxic,

Aspect	Relevant Legislation	Brief Description
		corrosive, irritant, strongly sensitising, flammable and pressure-generating under certain circumstances and may injure, cause ill-health or even death in humans.
	Hazardous Substances Regulations	The Regulations provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products.
Promotion to Access to Information	The Promotion of Access to Information Act (Act No. 2 of 2000	The Act recognizes that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. The purpose of the Act is to promote transparency and an accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their rights.
Transport	National Road Traffic Act (Act 93 of 1996)	The transportation of Dangerous Goods Regulations as set out in the National Road Traffic Act (Act 93 of 1996) are intended to promote the safe transportation of hazardous material through the effective management of systems and processes.
	National Land Transport Act (Act 5 of 2009)	One of the purposes of the Act is to prescribe national principles, requirements, guidelines, frameworks and national norms and standards for transportation across land. The Act covers the transportation of good across land and as such, the proposed project will be regulated under the Act as goods will be transported during the construction, operation as well as decommissioning phase.
Mine Health and Safety	The Mine Health and Safety Act (Act No. 29 of 1996)	The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA) aims to provide for protection of the health and safety of all employees and other personnel at the mines of South Africa. The main objectives of the act are:

Aspect	Relevant Legislation	Brief Description

		• Protection of the health and safety of all persons at the mines;
		• Requires employers and employees to identify hazards and eliminate, control, and minimise the risks relating to health and safety at the mines;
		• Gives effect to the public international law obligations of the Republic that concern health and safety at all mines;
		• Provides for employee participation in matters of health and safety through health and safety representatives and the health and safety committees at the mines;
		• Provides for effective monitoring of health and safety conditions at the mines;
		• Provides for enforcement of health and safety measures at the mines;
		• Provides for investigations and inquiries to improve health and safety at mines; and
		• To promote:
		  ○ Culture of health and safety in the mining industry;
		  ○ Training in health and safety in the mining industry; and
		  ○ Co-operation and consultation on health and safety between the State, employers, employees, and their representatives.

Municipal policies, plans, and by-laws, and Vametco's policies and world best practices were considered during the undertaking of the EIA process. The list of legislations that apply to the project is not an exhaustive analysis; however, it provides a guideline to the relevant aspects of each Act. Table 22 below provides a summarised list of applicable policies and guidelines, which are also applicable to the proposed activity and are to be considered in the assessment.

Table 22: List of Associated Policies and Guidelines

Aspect	Policy or Guideline	Brief Description
Municipal systems	Local Government: Municipal Systems Act (Act 32 of 2000)	Details all the systems issues that municipalities must be compliant with and allocate various functional requirements for various tiers of officials, as well as issues of municipal planning and performance management. This includes the review and comments of the Environmental Impact Assessment reports for development undertaken within the Municipality
Spatial Development Framework	Northwest Provincial Spatial Development Framework	Explains the spatial character of the province and details all the regional spatial issues. Consider what the PSDF explains as regional spatial context and include such in their SDFs.
Water	Water Services Act	Sets out the parameters and regulatory issues around the management of water and sanitation issues within the Municipality.
Air Quality	Madibeng Local Municipality: Air Quality management By-law	The objectives of this by-law are to: • Give effect to the rights contained in Section 24 of the Constitution of the Republic of South Africa by controlling and managing air pollution within the area of the municipality's jurisdiction; • Provide in conjunction with any other applicable law, an effective legal and administrative framework within which the Municipality can manage and regulate activities that have a potential to adversely impact the environment, public health, and wellbeing of any persons or living organisms; and • Ensure that air pollution is avoided, or where it cannot be altogether avoided, mitigated, or minimized.
Climate change	National Greenhouse Gas Emission Reporting Regulations	The purpose of the regulations is to introduce a single national greenhouse gas (GHG) reporting system, which will be used to inform policy formulation and help South Africa to meet its

Aspect	Policy or Guideline	Brief Description
	(GG No. 40762, Notice 275)	international obligations such as targets set under the United Nations Framework Convention on Climate Change.
	South African National Climate Change Response White Paper	The South African National Climate Change Response White Paper (White Paper), published by the Department of Environmental Affairs (DEA, 2011), prioritises both climate change mitigation and adaptation in moving towards a climate-resilient and lower-carbon economy and society.
	United Nations Framework Convention on Climate Change (UNFCCC)	The UNFCCC is an international treaty formed by the United Nations in 1992. The objective of the treaty is to stabilise greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system.

The specialist studies undertaken in preparation of this EMPr recommended plans and programs that need to be prepared and implemented at different phases of the project to ensure effective implementation of mitigation measures and ease monitoring. Some of the recommendations may require regular updates, and this will need to be done as recommended. Table 23 provides a list of plans and programs that are either pre-requisite for construction or a requirement for the operational and decommissioning phases of the mine operations.

Table 23: Applicable Plans and Programs

Specialist	Purpose	Frequency
Groundwater Management Plan	The objective of the plan is to identify the potential direct and indirect impacts on groundwater flows and quality and develop management and monitoring measures that maximise the ongoing protection of groundwater dependent systems to be retained from disturbance by mining activities.	Prior to operation of the proposed new activities; and continuously.
A GN 704 Audit	The notice was established to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. To assist with compliance to the separation of clean and dirty water infrastructure, unless	Triennially

Specialist	Purpose	Frequency
	otherwise, the frequency of the audit is determined by the existing Water Use Licence;	
Water balance model	To describe the flow of water in and out of the mining operations. Account for water usage.	Prior construction and annually
Biomonitoring Plan	To create a measurable reference for mine personnel with regards to the proliferation or degradation of ecological function.	Prior construction and bi-annual thereafter.
Soil Management Program	Must be implemented before construction activities are initiated to secure all wetland soils in situ as these will be utilised for mitigating wetland loss through the wetland mitigation and rehabilitation plan.	Prior construction commencement
Stormwater Management Plan	The Stormwater Plan must include adequate attenuation facilities to ensure that peak flows do not cause negative impacts on wetlands.	Prior Construction commencement for the proposed new activities and it must be integrated with the existing SMP for the mining and monitored continuously.
Emergency Response Plan	To respond to any emergency situations (fires, spillages, etc.).	Continuous
Bullfrog Monitoring and Management Plan	To ensure effective relocation and preservation of bullfrogs if present.	Prior construction commencement
Open Space Management Plan	For proper management of open spaces affected by the project.	Prior construction commencement

Specialist	Purpose	Frequency
Alien Invasive Plant Management and Control Plan	To manage and control alien invasive plants.	According to the DEA minimum requirements.
Biodiversity Management Plan	To ensure that the proposed that the proposed avoidance and mitigation measures associated with the mine construction and operation are effectively implemented.	Prior construction commencement
Plant Search and Rescue and Monitoring Plan	To identify all individual plants that need to be relocated or monitored based on their levels of conservation concern	Prior construction commencement.
Dust-fallout monitoring	To ensure dust generated does not exceed the NEMAQA allowable limits.	During operational phase
Soil and Agriculture	A short-term fertilizer program	For 2 to 3 years after rehabilitation or until the area can be declared as self-sustaining by an appropriately qualified soil scientist.
Climate Change Management /Adaptation Plan	Temperature and humidity levels must be monitored on site.	Daily
	A continuous monitoring station should be installed to obtain site specific wind data. Regular maintenance checks for wind-related damage should be performed.	Continuous – Daily
	Regular monitoring of fuel and energy used on site.	Daily/Weekly

7.1 METHOD STATEMENTS FOR THE ACTIVITIES TO BE CARRIED OUT

The environmental specifications are underpinned by a series of Method Statements (MS). Method Statements are required from Contractors and Service Providers to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to Vametco before commencement of activities on site:

The Method Statements must cover pertinent details regarding but not limited to the following:

- Site layout.
- Emergency/disaster incident and reaction procedures.
- Construction procedures.
- Delivery and storage of materials and equipment to be used.
- How the equipment/material will be moved while on-site.
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur.
- Compliance/non-compliance with the Specifications.
- Any other information deemed necessary by Vametco and ECO.

Specific method statements required may include but not limited to:

- Vegetation clearing.
- Site establishment and site layout plan.
- Fauna and Flora management.
- Excavations.
- Chemical/hazardous substance storage.
- Workshop and Material Equipment Storage.
- Plant- Refuelling.
- Cement/concrete use.
- Environmental awareness training.
- Fire management.
- Emergency response.
- Storm water and soil erosion management.
- Waste management.
- Servitude and Access Road(s).

- Contaminated water management.
- Temporary site closure.
- Site rehabilitation.
- Soil Stripping
- Blasting.
- Alien plants management and use of herbicides and pesticides.
- Dust management.
- Noise control.

The above is not an exhaustive list of the required MS; there may be other activities/aspects that may require same prior to the commencement of the work. Additional MS may be required as the project progresses.

8 DESCRIPTION OF MITIGATION MEASURES

This section serves to prescribe mitigation measures to prevent, reduce, eliminate, or compensate for impacts, to acceptable/insignificant levels.

8.1 PRE-CONSTRUCTION MANAGEMENT PROGRAMME

The pre-construction management programme is to be used as a guideline during the planning, design, and detailing of the development components. This part of the programme is to be referenced by all personnel involved in decision-making during the planning and design phases. The responsible agents (Table 24) are abbreviated as follows:

Table 24: Responsible agents

Title	Abbreviation
Contractor Environmental Officer	CEO (where applicable)
Environmental Control Officer	ECO
Environmental Manager	EM
Project Manager	PM
Business Unit Manger	BUM

8.1.1 Pre-Construction Activities

Objective	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Ensure that proper environmental conditions are established prior to commencement of construction activities by informing all parties of appropriate environmental protection measures.	• The successful tendering Contractors/third parties are made aware of the contents of this EMPr and any penalties arising from non-compliance before the commencement of the work. • Appoint a suitably qualified environmental manager and Environmental Control Officer (ECO) who will be responsible to monitoring compliance to the EMPr. ○	• Signed Declaration by contractor. • Appointment Letter. • Proof of submission of ECO appointment to DMRE.	• PM	• Pre-construction.

Objective	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Record and mapping of sensitive species and environments before construction commencement.	• Conduct a thorough footprint investigation to record all Protected or Threatened plant species (population and its size) after the final layouts of the solar plant has been approved and prior to any new groundworks. • All potential floral SCC that will be affected by surface infrastructure must be marked and, where possible, relocated to suitable habitat surrounding the disturbance footprint. The removal and/or rescue and relocation should be overseen by a qualified specialist in association with a suitably qualified horticulturist. The relevant permits must be applied for from the various authorities before commencement of the construction phase should any SCC be recorded. • It is recommended that before any construction or earthmoving activities occur, a detailed walk down of all-natural areas falling within the final expansion footprint area will be undertaken to ensure no floral SCC is associated with the expansion activities. • The walkdown should be undertaken during the summer season when most floral species will be in flower, and accurate identification will be easier. • Should any floral SCC be identified within the development footprint, permits will have to be obtained from the relevant	• Records by a qualified biodiversity specialist. • Maps of the population of protected species. • Photographic evidence of preconstruction. • Search and Rescue Plan and implementation reports.	• PM	• Pre-construction.

Objective	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
	authorities prior to any vegetation clearing activities taking place. • After the final layouts of new activities have been approved and before any new groundworks, conduct a thorough footprint investigation (during summer) to record all Protected or Threatened plant species (population location and size). • The sensitive Freshwater Habitat and associated buffer zones (refer to the Freshwater Assessment) must be designated as No-Go areas and no mining vehicles, personnel, or any other mining related activities are to encroach upon these areas. • Map (by GPS) all populations of Protected or Threatened species that must be avoided or relocated. • Compile a photographic and relocation guide for the affected species. • Follow up by implementing the necessary Search and Rescue actions before any groundworks taking place, in line with future mining plans to ensure no destruction of indigenous species of conservation concern.			
• Awareness training on heritage material and artefacts chance of find.	• Contractors should be given training on how to identify and protect archaeological remains that may be discovered during the project. The pre-construction training should include some limited site recognition training for the types of archaeological sites that may occur in the construction areas.	• No heritage artefacts found.	• ECO • EO	• Pre-construction.

Objective	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
	Below are some of the indicators of archaeological site that may be found during construction: o Flaked stone tools, bone tools and loose pieces of flaked stone; o Ash and charcoal; o Bones and shell fragments; o Artefacts (e.g., beads or hearths); o Packed stones which might be uncounted underground and might indicate a grave or collapse stone walling.			

8.2 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME

This section relates to the construction activities at Vametco mine expansion project and may also be implemented during any other construction activities within the mine that do not trigger listed activities.

8.2.1 Site establishment

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Disturbance on the natural environment.	• To ensure minimal disturbance of the environment	• NEMA. • Construction Regulations.	• Vametco and the ECO must identify suitable areas for the establishment of site office and lay down areas on the least sensitive locations prior commencement of the construction	• Inspection Report. • Site Plan.	• PM • ECO • CEO	• Prior to site establishment.

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Disturbance to soil and vegetation	during the construction site establishment.		camp site and associated infrastructure. • Once these items have been addressed, site establishment shall take place in an orderly manner, and all amenities shall be installed before the workforce moves onto the site. Construction camps on the site must be de-established post-construction. • Rehabilitation must be done in accordance with the rehabilitation plan and/or approved Method Statement. **8.2.1.1 Site Plan** Documentation for the campsite must be prepared by the Contractorprior tothe commencement of construction activities and must be submitted to Vametco for approval. **8.2.1.2 Site Camps**			

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			No site camps will be permitted. **8.2.1.3 Vegetation clearing:** • The natural vegetation encountered on site must be conserved and left intact as much as possible. • Only vegetation within the approved construction footprint must be cleared and clearance must be as per the approved Method Statement in line with other requirements of this EMPr. • Should protected species be found the specialist recommendations regarding same must be consulted. • Areas must not be stripped of vegetation before the area will be needed for construction. • Use a phased approach in clearance activities. • The self-succession of vegetation will be encouraged after construction.			

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Only the immediate footprint must be cleared for construction. • Disturbed areas must be rehabilitated according to the approved rehabilitation plan. **8.2.1.4 Water for human consumption:** Potable water must always be made available during all the phases of the project. **8.2.1.5 Sewage Treatment:** • Chemical toilets must be supplied (1 per 15 persons) and must be regularly cleaned and maintained by the Contractor. • The Contractor must arrange for regular emptying of toilets by a registered service provider and be entirely responsible for enforcing their use and maintenance.			

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• The ablution facilities must be at least 100m away from the watercourses and associated buffers. • All ablution facilities must be anchored to prevent them from being toppled by the wind. • Ensure final sewage waste disposal sites have the necessary legislative approvals and are registered.			

8.2.2 Sensitive Ecology

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Impact on sensitive ecology. (i.e., floral habitat, species, and floral SCC). • Displacement and direct	• To ensure that sensitive areas are not disturbed. • To ensure minimal or no disturbance to vegetation on	• NEMBA (107 of 1998).	The following plan and Method Statements must be prepared: • Implement an alien invasive plant monitoring and management plan whereby the spread of alien and invasive plant species is regularly removed, and re-infestation monitored on site.	• Inspection Report; and • Site plan.	• PM • ECO; and • CEO.	• Prior to construction commencement.

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)	and around the site. • To prevent negative impact on both flora and fauna.		• Applicable Method Statement as indicated in Section 7 must be prepared and approved by the ECO. The following measures must be adhered to: • All construction staff must undergo environmental induction before construction commences to raise awareness and reduce potential floral and faunal impacts. • All areas of increased ecological sensitivity falling outside of the expansion activities footprints must be designated as No-Go areas and be off limits to all unauthorised construction vehicles and personnel. • The Magnetite Dumps, TSF, PCDs, Solar Park, RWD and their expansion, should be restricted to the footprint area that is authorised. Weekly monitoring and recording of the footprint areas must be done.			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• All construction and associated mining activities must be structured to avoid areas of high sensitivity and CBAs. • Demarcate the authorised construction footprint to avoid unnecessary vegetation clearing, and clearing must be in following the approved Method Statement. • Ensure that 'No-Go' areas are restricted and delineated before construction activities commence. • The access barriers must be maintained in good condition throughout the course of the construction. • No open fires are permitted. • The use of existing roads and tracks is promoted while creating new unauthorised routes through vegetated areas are prohibited. • Only manual removal of weed will be permitted on site. Chemical and mechanical (TLB, bulldozer) control is not allowed on site.			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Any fauna threatened by construction activities must be removed to safety by a suitably qualified person. • Avoid sensitive faunal habitats such as drainage lines and wetlands. • The flow of the watercourses may not be affected by construction activities. • It is recommended that before the commencement of construction activities, the entire construction servitude be delineated and clearly demarcated to limit footprint creep and edge effects; • Revegetation of disturbed areas should be carried out to restore habitat availability and minimise soil erosion and surface water runoff; • Any temporary roads must be rehabilitated as soon as they are no longer in use to prevent effects of habitat fragmentation. • All high sensitivity areas should be avoided as far as possible, and development must be prioritised in low or medium areas.			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• All areas of increased ecological sensitivity falling outside of the expansion activities footprints must be designated as No-Go areas and be off-limits to all unauthorised construction vehicles and personnel. • Watercourses, drainage lines, streams and wetlands must be avoided, and a no-go buffer of 20m must be applied around them. • Existing access routes, especially roads must be used. • Hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding wetland area. • A qualified environmental control officer must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season and any SSC should be noted. • In situations where the threatened and protected plants are found and must be			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			removed, Vametco must apply for the required permission/permits in accordance with national and provincial legislation. • Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. • Clearing of vegetation should be minimized and avoided where possible. • All activities must be restricted too within the low/medium sensitivity areas. • No further loss of high sensitivity areas should be permitted. • It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon. • All laydown, chemical toilets etc. should be restricted to low sensitivity areas. • Any materials may not be stored for extended periods of time and must be			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			removed from the project area once the construction phase has been concluded. • No storage of vehicles or equipment must be allowed outside of the designated project areas. • Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species. • All livestock must always be kept out of the project area, especially areas that have been recently re-planted. • It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. • No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas. • Any individual of the protected plants that are present needs a relocation or destruction permit for any individual that may be removed or destroyed due to the development. • High visibility flags must be placed near any threatened/protected plants to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program. • Development areas where protected plants cannot be avoided, must adhere to a SCC management plan, and these plants should be removed and relocated/ replanted in similar habitats where they should be able to resprout and grow again.			

Possible Impact	Objective/s	Applicable Legislation/ policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• All protected and red-data plants should be relocated, and as many other species as possible. • For the threatened species that may not be destroyed, it is recommended that professional service providers that deal with plant search and rescue be used to remove such plants and use them either for later rehabilitation work other conservation projects.			

8.2.3 Materials handling, use and storage

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Impact on human health. • Seepage contamination of soils and water resources •	• To ensure safe handling, storage, use and disposal of hazardous substances. • To ensure full compliance with the requirements of the	• OHSA. • Construction Regulation (2013).	**8.2.3.1 Safety:** • All necessary handling and safety equipment required for the safe use of hydrocarbons shall be provided by the Contractor to be used and/or worn by the staff.	• Inspection Report; and • Incident Report.	• ECO; and • CEO.	• Continuous.

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
	applicable legislation.		• The Contractor must comply with the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and Construction Regulations (2003). **8.2.3.2 Hazardous Material Storage:** • Hydrocarbons and other hazardous substances will only be stored in a secured, designated area with restricted entry. • Spill Kits will be provided to store contaminated materials on site e.g. Soil • Storage of hazardous products will only be in suitable containers. Safety Data Sheets (SDS) of the hazardous material stored must be always available on site and in the safety file. • All hydrocarbons, irrespective of the volumes, shall be stored on a smooth, impermeable surface (concrete) with a permanent bund. The impermeable lining shall extend			

Possible Impact	Objective	Applicable Legislation	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			to the crest of the bund and the volume inside the bund, shall be 110% of the total capacity of all the storage tanks. • Gas welding cylinders and LPG cylinders must be stored in a secure, well-ventilated area. The Contractor must supply sufficient fire-fighting equipment in the event of an incident. • Strictly, no smoking is allowed where fuel is stored and used. • All laydown, chemical toilets etc. should be restricted to low sensitivity areas. • Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded.			

8.2.4 Water supply

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Surface Water Consumption.	• To ensure availability of water for various uses as and when required. • To ensure that water usage is minimized. • To always conserve water resources. • To encourage a 3R (Reduce, Reuse, Recycle).	• NWA.	• • The ECO, Mine Manager, Environmental Practitioner must ensure that a Water Use Licence is available on site. • All water uses within the mine must be authorised and authorisations must be kept on site. • Water conservation through reducing reusing and recycling must be implemented throughout. • Contractor must always supply potable water for human consumption. • Grey water must be used for dust suppression when necessary. •	• Water consumption records.	• ECO; and • Contractor.	• On-going during the construction phase.

8.2.5 Vehicular access and movement of construction vehicles

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
• Damage to protected /endangered vegetation. • Damage to sensitive areas. • Erosion and loss of topsoil.	• To prevent ecological damage. • Minimise damage to the identified watercourses. • Minimise erosion of embankments and subsequent siltation of watercourses.	• CARA; • NEMBA; and • NWA.	• Access to the site shall be designed/mapped and approved by the ECO. • The Contractor must demarcate the boundaries of the working areas, access roads, haul roads, or paths before commencing any work. • Ensure that access roads to the site are suitably built to eliminate soil erosion and channel stormwater. • No illegal use of private roads is permissible. • No roads shall cut through water courses as this may lead to erosion, causing siltation of streams unless otherwise authorised. • Upon completion of the project, all roads shall be repaired/rehabilitated to their original state. • During construction, all vehicles must adhere to demarcated tracks or roads. • Dust suppression must be implemented to reduce dust impacts on surrounding areas. • All authorisations and permits must be obtained for the transportation of abnormal	• Photographic record of private roads prior to the Contractor using the roads. Site plan • Regular monitoring of access roads condition. • Monitoring of impacts into the surrounding areas.	• PM • ECO • CEO.	• Continuous during the construction phase.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
			loads and hazardous materials on public roads. • Measures must be taken to ensure that all health and safety requirements regarding transportation activities are complied with. This may include dust covers for hauling vehicles and dust control on all gravel roads. • Controls should be in place to ensure that vehicles departing the site are not overloaded. • All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. • Speed limits must still be enforced to ensure that road killings and erosion is limited.			

8.2.6 Movement of construction personnel and equipment

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Impact on sensitive environs. • Trespassing • Safety and security.	• To ensure controlled and managed movement of personnel and equipment.	• NEMA.	• The Contractor must ensure that all construction personnel, labourers, and equipment always remain within the demarcated construction sites. • Where construction personnel move outside the boundaries of the site, the Contractor/ labourers must obtain permission from the EO. • All equipment moved on-site or off-site is subject to the legal requirements as well as Vametco's specifications for the transport of such equipment. The Contractor shall meet these safety requirements under all circumstances. • All equipment transported shall be clearly labelled as to their potential hazards according to specifications. • All the required safety labelling on the containers and trucks used shall be adhered to. • The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident and shall provide a Method statement to that effect. • The Contractor shall ensure that no machinery, personnel, material, or equipment enters 'No-Go' areas.	• Inspection Report. • Security registers. • Complaints register.	• ECO; and • Contractor.	• Continuous throughout the construction phase.

8.2.7 Protection of flora and fauna

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
• Damage faunal and flora habitat. • Establishment and spread of alien invasive species. • Loss of flora species of conservation concern. • Loss and disturbance of fauna of conservation concern.	• To conserve vegetation and listed or protected species. • To ensure the control of alien invasive species and to ensure that rehabilitation is as close as possible to the original state.	• NEMBA.	During the field assessment, four faunal and floral habitat units have been identified within the focus area, i.e., the Degraded Marikana Thornveld, Freshwater Habitat, Rocky Outcrop and Transformed Habitat. As a result, the sensitive environment will be affected by the proposed construction activities. The following must be adhered to: • A preconstruction walk-through is recommended to identify Species of Conservation Concern (SCC) or Species Special Concern (SSC) that must be avoided or rescued. • Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible. • Pre-construction environmental induction for all construction staff on-site to ensure that basic environmental principles are adhered to. This includes waste management, handling of pollution and chemical spills, fire hazards, wildlife interactions, etc. • Demarcate all areas to be cleared with construction tape or other appropriate and effective means. Caution must	• Inspection Report • Complaints register.	• ECO; and • CEO.	• Continuous during the construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
			be exercised to avoid using material that might harm fauna. • All vehicles must stay within the demarcated tracks or roads. • To avoid impacts on amphibians, all spills of hazardous material should be cleared according to the nature and identity of the spill and all contaminated soil removed from the site. • Weed eradication and control will be actively managed during the construction, operational, and decommissioning phases of the mine. **8.2.7.1 Avoid or minimise loss of sensitive habitats:** • Avoid any disturbance to the No-Go habitats, i.e., Degraded Marikana Thornveld situated to the north, east and west of Vametco mine. existing • Minimise the physical destruction of any remaining primary vegetation, especially in or near wetland areas. In general, minimise clearing and operations in habitats with a High.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
			• Sensitivity rating and delineate and maintain a no-go buffer of at least 100 m around such habitats. • Avoid any direct impacts of mining operations on any surrounding or adjacent areas with sensitive habitats or adjacent or nearby riparian habitats (except the clearing of alien invasive species). • No collection of floral SCC or medicinal floral species within the site boundary must be allowed by construction personnel; and - Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed expansion footprint area. • Avoid blocking and/or destruction of any seasonal streams, channelled or un-channelled valley bottom wetlands or hillslope seepage areas. • Minimise channel crossings for any kind of road; if this is unavoidable, ensure channels are crossed by elevating the road surface and allowing free flow of water by installing culverts. • Spills and /or leaks from construction equipment must be immediately remedied and cleaned up to ensure that these chemicals do not enter the Freshwater Habitat			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
			situated to the west and east of the existing Vametco Alloys Mining and Beneficiation Plant. • A qualified environmental control officer must be on site when construction begins. • A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season and any SSC should be noted. • In situations where the threatened and protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species. • Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated. The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
			• The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna. • Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals. • Should the holes be left overnight, they must be covered temporarily to ensure no small fauna species fall in. • Ensure that cables and connections are insulated successfully to reduce electrocution risk. • Any exposed parts must be covered (insulated) to reduce electrocution risk. • Schedule activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons. • The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna. • Clearing of vegetation should be minimized and avoided where possible.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria/	Responsible Agent	Monitoring Frequency
			• All activities must be restricted too within the low/medium sensitivity areas. • It is recommended that only the demarcated areas be impacted upon. • The areas to be developed must be specifically demarcated by signages to prevent movement of staff or any individual into the surrounding environments. • Ensure that cables and connections are insulated successfully to reduce electrocution risk. • Any exposed parts must be covered (insulated) to reduce electrocution risk.			

8.2.8 Avifauna

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Electrification of avifaunal species. • Direct mortality from persecution or poaching of	• To ensure the protection of avifauna.	• NEMA	• All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species, and owls, which are	• Inspection Report	• ECO; • Design Engineer; and	• Daily throughout construction.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
avifauna species and collection of eggs. • Direct mortality from increased vehicle and heavy machinery traffic. • Destruction, degradation and fragmentation of surrounding habitats. • Displacement/emigration of avifauna community (including SCC) due to noise pollution. • Chemical pollution associated with dust suppressants. • Habitat destruction within the project footprint.			often persecuted out of superstition. Signs must be put up to enforce this. • The duration of the construction should be kept to a minimum to avoid disturbing avifauna. • Outside lighting should be designed and limited to minimize impacts on avifauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (red/green) lights should be used wherever possible. • All construction motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (20 km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited. • All project activities must be undertaken with appropriate noise mitigation measures to avoid disturbance to avifauna population in the region. • All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area.		• CEO.	

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Should any Species of Conservation Concern be found and not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken. • The design of the proposed PV and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2015). It therefore must be a bird-friendly design. • Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. • All the parts of the infrastructure must be nest-proofed and anti-perch devices placed on areas that can lead to electrocution. • Use environmentally friendly cleaning and dust suppressant products.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• As far as possible power cables within the project site should be thoroughly insulated and preferably buried. • Any exposed parts must be covered (insulated) to reduce electrocution risk. • The areas to be developed must be specifically demarcated to prevent movement into surrounding environments. • High sensitivity areas must be declared No-go areas, they must be demarcated to ensure no vehicles or people move into these areas. • Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. • Cement mixed on site must be mixed in a bunded area or on a removable surface such as thick plastic sheeting at least 50 m away from any wetlands or water resources. • Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• A fire management plan needs to be complied to restrict the impact of fire.			

8.2.9 Heritage / Archaeological sites

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Destruction of sites of archaeological and heritage significance. • Loss of historic cultural landscape. • Loss of heritage value	• To preserve any heritage, cultural or archaeological sites that might be encountered during the construction phase. • Protection of known sites	• NHRA	The Heritage and Archaeological impact assessment were conducted within the Vametco MRA in terms of the National Heritage Resources Act, 1999 (No 25 of 1999). As a result, approximately 30 formal graves with tombstones were recorded at the site proposed for the Tailings Storage Facility (TSF) and Return Water Dam (RWD). Therefore, the is following must be adhered to:	• Detailed record of chance finds. • Management of existing sites and discoveries following the recommendations of the Archaeologist.	• Inspection Report.	• ECO; • CEO; and • Archaeologist.	• On-going during all excavations.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
due to change in land use.	against destruction, vandalism, and theft. • Preservation and appropriate management of any new archaeological sites should this be discovered during construction.		• An estimated 30 historical graves must be exhumed and relocated to another formal graveyard. • The identified historical building must be conserved through documentation before it is destroyed. • A historical building destruction permit must be acquired from SAHRA before a building/ruins are destroyed. • However, if previously unknown human remains are accidentally uncovered during development, work on the affected section and the immediate vicinity must be halted and the finds protected and reported to SAHRA. • Furthermore, should any archaeological materials (e.g., fossils, bones, artefacts etc.) or human burials be exposed during construction, affected families must be consulted, relevant rescue				

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			relocation permits must be obtained from SAHRA/NWHRA before any grave relocation can take place. Furthermore, a professional archaeologist must be retained to oversee the relocation process in accordance with the National Heritage Resources Act 25 of 1999. • Where burial sites are accidentally disturbed during construction, the affected area must be restricted as no-go areas. • No person may, without a permit, destroy damage, excavate, alter, deface, or otherwise disturb any archaeological or paleontological site or any meteorite.				

8.2.10 Servicing and re-fuelling of construction equipment

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria/ Performance Indicator	Responsible Agent	Monitoring Frequency
• Impact on soil and water resources due to accidental spillages.	• To preserve soils, surface, and ground water. • To prevent spillages of hazardous substances.	• NEMWA; • NWA; and • OHSA.	During the construction phase, the maintenance of construction materials and equipment may lead to environmental degradation and contamination. Therefore, the following mitigation measures must be adhered to: • All maintenance and repair work must be carried out within an area designated for this purpose and equipped with necessary pollution containment measures. • Refuelling, greasing, or oiling of vehicles and construction machinery must be done on a drip tray or bunded surface. • Effective drip trays must be always placed under stationary construction vehicles and machinery. • No vehicles or equipment with leaks or causing spills will be permitted on site.	• No evidence of hazardous substances polluting the site.	• On-going monitoring with regular inspections; and Service Records.	• ECO; and • CEO.	• On-going during the construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria/ Performance Indicator	Responsible Agent	Monitoring Frequency
			• Fuel required during construction must be stored at a central depot that must be located on a slab and be contained within a bund capable of containing at least 110% of the total volume in the containers. • Temporary fuel storage tanks and transfer areas must be located on an adequately bunded surface to contain accidental spillages.				

8.2.11 Waste management

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Visual Impact. • Water resources contamination. • Land pollution.	• To ensure the efficient management of waste on-site.	• NEMWA • NWA	Vametco generates different types of waste ranging from general to hazardous waste. This also include mine wastes such as magnetite, tailings, and wastes rock. The following mitigation measures and recommendations must be adhered to:	• Inspection Report • Waste Disposal Records	• ECO; and • CEO.	• Daily throughout construction.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Degradation of surrounding habitats due to improper waste disposal.	• To ensure minimal waste impacts on the surrounding environment. • Minimise waste material being strewn in the environment.		• The mine's waste management strategy must be adopted and implemented during the construction phase. • The contractor must prepare a Waste Management Method Statement for approval by the ECO. • Waste management must form part of the induction process to ensure that all workers on site fully understand all practices involved with proper waste management. • It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area. • The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility. • Where a registered disposal facility is not available close to the project area, the Contractor shall provide	• Water monitoring report.		

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site. • Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days. **Solid Waste Management:** • Waste must be separated at source (e.g., general, scrap metals, and hazardous waste). • An adequate number of scavenger proof refuse bins must be provided at the construction site and must be clearly labelled (general/ hazardous, etc.) according to waste streams. • All waste must be transported in an appropriate manner and disposed of at a licensed waste disposal facility. Proof of safe disposal must be kept on site. • The Contactor must not dispose of any waste and/or construction debris by burning or burying. • Waste bins must be emptied on-call based on inspection such that they do not overfill.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• The Contractor shall maintain 'good housekeeping' practices and ensure that all work sites and the construction camp are kept tidy and litter-free. • Groundwater monitoring boreholes must be placed strategically around all disposal sites. **<u>Liquid Waste Management:</u>** • An adequate number of suitable waste containers with lids must be provided at the construction site. • All waste must be transported appropriately and disposed of at a licensed waste disposal site. • All requirements of the NEMWA, supporting policies and guidelines must be adhered to. •			

8.2.12 Surface and groundwater management

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Possible contamination	• To protect and conserve water resources.	• NWA.	The following mitigation measures must be implemented in relation to water resources:	• Inspection Report; and	• CEO; and • ECO.	• Continuous through the

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
of water resources. • Loss of vegetation within development footprint	• To avoid illegal diversion and destruction of water resources. • To ensure proper management of storm water run-off that causes erosion and siltation/sedimentation. • To ensure that the rivers and streams are protected and incur minimal negative impact from the development. • To ensure compliance with the requirements of the Act.		• Adequate stormwater management practices must be incorporated into the design of the proposed development to prevent erosion of topsoil and the loss of floral habitat through the discharge of dirty water into the receiving environment. In this regard, special mention is made of: • Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed. • Runoff from paved surfaces should be slowed down by the strategic placement of bioswales. • The Contractor must take reasonable precautions to prevent the pollution of ground and surface water resources due to construction activities. • No natural watercourse is to be used to clean tools, bathing, washing clothes, etc. • No spills may be hosed into the surrounding natural environment. • All contaminated soil must be excavated to the depth of contaminant penetration, placed in suitable drums/containers, and removed to a hazardous waste facility.	• Design Plans.		construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• No abstraction of water from any natural resources without the relevant authorisation. • Erosion control measures must be put in place to control stormwater runoff. • Stormwater management measures must be as per the approved Storm Water Management Plan. • Erosion control measures on all access roads must be implemented. • Any physical damage to any aspect of a watercourse must be prohibited. • Avoid mining activities in the wetland areas and other watercourse as far as possible through proper planning, demarcation, and appropriate environmental training.			

8.2.13 Sensitive areas (water courses and buffers)

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Changing the quantity and fluctuation	• To preserve and conserve the	• NWA	• The following mitigation measures must be considered during different phases of the project:	• Inspection Report; and	• ECO; and • CEO.	• Throughout the

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
properties of watercourses. • Changing the amount of sediment entering water resource and associated change in turbidity • Alteration of water quality toxic contaminants including toxic metal ions and hydrocarbons. • Changing the physical structure within a water resource. • Loss of vegetation within development footprint. • Spread and/or establishment of invasive alien species. • Spread and/or establishment of invasive alien species.	sensitive environment.		• No stockpiling of any materials may take place adjacent to any of the water resources. • Erosion control measures must be implemented particularly in areas prone to erosion and where erosion has already occurred. These measures include but are not limited to the use of sandbags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells that must be used to protect slopes. • Prevent surface water or stormwater from being concentrated; or flow down slopes without erosion protection measures. • Concurrent rehabilitation of disturbed areas is encouraged. • Make use of existing access roads as much as possible and plan additional access routes to avoid vegetation communities. • Minimise the extent of the work footprint as far as possible. • All waste generated during construction shall be disposed of at an appropriate facility and proof provided.	• WUL.		construction and post construction to ensure proper rehabilitation.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Degradation of surrounding habitats. • Disruption/alteration of species activities (breeding, migration, feeding) due to noise and vibration. • Spread and/or establishment of invasive alien species. • Degradation of surrounding habitats due to improper waste disposal, dust precipitation and spilling of hazardous waste. • Destruction of threatened and protected plant species and Direct mortality of fauna (including possible SSC).			• No release of any substance i.e., cement, oil, that could be toxic to fauna or faunal habitats within the watercourses. • Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants adequately drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately. • A spill management plan must be developed for the construction phase. • No construction must take place within the riparian zone of the watercourse. • Demarcate the watercourses and buffer zones to limit disturbance and clearly mark these areas as no-go areas. • Recommendations from the DWS as part of the licensing process must be taken into consideration throughout the construction phase.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• All high sensitivity areas should be avoided as far as possible, and development must be prioritised in low or medium areas. • Existing access routes, especially roads must be made use of. • All laydown, chemical toilets etc. should be restricted to low sensitivity areas. • Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. • Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. • No storage of vehicles or equipment must be allowed outside of the designated project areas. • Watercourses, drainage lines, streams and wetlands must be avoided, and a no-go buffer of 20m must be applied around them. • All laydown, chemical toilets etc. should be restricted to low sensitivity areas.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Structure currently located within wetlands and buffer zones should not be included in the final layout and must be moved. • Designs should consider regional hydrological dynamics. • Have a contingency plan ready for potential spills from the pump house. • A temporary fence or demarcation must be erected around No-Go Areas outside the proposed study area prior to any construction taking place as part of the contractor planning phase when compiling work method statements to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMP. High energy stormwater input from the site into the watercourses should be prevented at all cost. • Steps/ weirs to be included to facilitate species movement- migration functionality can be improved. • Avoiding the perennial and non-perennial areas. • Stormwater must be attenuated.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Establishing buffer zones and setbacks along watercourses to protect them from direct impacts and minimize disturbance. • Implementing sediment and erosion control measures during construction to prevent sediment runoff and reduce erosion into watercourses. • Implementing spill prevention and response protocols to minimize the risk of accidental spills or releases of hazardous substances into watercourses. • Conducting regular water quality monitoring to assess the condition of watercourses and promptly address any issues or exceedances. • Incorporating native vegetation and riparian restoration efforts to enhance the natural filtration capacity of watercourses and provide habitat for aquatic organisms. • Adhering to environmental regulations and permit requirements related to watercourse protection and engaging with regulatory agencies for guidance and compliance.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Implementing fish-friendly screens and fish passage solutions to enable the movement of fish through the solar plant area and minimize barriers to migration. • Developing and implementing an environmental management plan specific to the solar plant, outlining measures to minimize impacts on watercourses and promote their long-term health and functionality. •			

8.2.14 Hazardous materials

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Impact on soils and water resources.	• To ensure safe and proper handling of hazardous material.	• HSA; and • OHSA.	• The Contractor must comply with all National, Regional and Local legislation concerning the storage, transport, use, and disposal of petroleum, chemical, harmful, and hazardous substances, and materials. • Equipped spill kits must -always be available on site. • The Contractor EO will furthermore be responsible for the training and education of all personnel on-site who will be	• Hazardous material data sheet • Incident reports.	• ECO; and • CEO.	• Continuous throughout the construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			handling the material about its proper use, handling, and disposal. • Storage of all hazardous material must be safe, tamper proof and under strict access control. • Exercise extreme care with the handling of diesel and other toxic solvents to ensure that spillage is avoided. • Any accidental chemical / fuel spills must be remediated immediately. • The management of chemicals and hydrocarbons must form part of the emergency preparedness and response programme. No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may be undertaken outside of an effectively designed contained area. • Regular safety checks and maintenance of the storage tanks should be undertaken by suitably qualified safety officers. • Stormwater collected within the bunded area should remain separate from other stormwater and need to be treated to an acceptable level prior to release. • It is also recommended that the Environmental Best Practice Specifications published by the DWAF (Integrated Environmental Management Series, Environmental Best			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			Practice Specifications: Operations, Edition 3, DWAF, 2005) be adopted for this development. • An emergency response plan must be implemented to clean and remediate any coal spillages as soon as they happen to prevent carbonaceous and harmful derivative materials from being washed into watercourses through either surface or Hydropedological pathways. • Emergency plans and infrastructure to deal with spillages (especially hydro-carbon spillages) must be in place; this should include mobile response units to deal with spillages in the field. • Storage of potentially hazardous materials must be above any 100-year flood line or as agreed with the ECO. These materials include fuel, oil, cement, bitumen etc. • Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils. • All construction materials liable to spillage are to be stored in appropriate structures with impermeable flooring. • No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			Any discharge points need to be approved by the relevant authority. • In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water and Sanitation must be informed immediately. • Provide bins for construction workers and staff at appropriate locations, particularly where food is consumed.			

8.2.15 Oil Spill Management

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Soil structure contamination due to waste contamination and spillages being created during the construction activities.	• To avoid ground and surface water contamination • To ensure proper and safe handling of oil spillages.	• HSA . A= (83 of 2003).	• Oil spill management will form part of the induction process provided by the mine. There will be an incident management system, including procedures and training for dealing with incidents. • No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may be undertaken outside of an effectively designed contained area. • All spills must be reported to the ECO within 24 hours of occurrence.	• Inspection Report. • Incident report.	• ECO; and • CEO.	• On-going during the construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Spillages of hydrocarbons or any other chemical could lead to surface water pollution.			• Major spillage incidents will be reported to the DMRE and DWS. Appropriate remedial measures will be implemented in consultation with these regulatory authorities. • The Contractor must always be in possession of a mobile oil spill kit. • The oil spill procedure and emergency preparedness plan must be implemented. •			

8.2.16 Storm Water Management

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Negative impact on water resources	• To reduce the potential impact from runoff on sensitive areas.	• NWA.	• Design all structures to ensure clean and dirty water separation as stipulated in Regulation 704 of the National Water Act. • Implement an ecologically sensitive stormwater management plan that includes not allowing stormwater to be discharged directly into the identified watercourse and drainage lines.	• Site Plan; and • Inspection Report.	• ECO; and • CEO	• Continuous during the construction.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Increased runoff due to vegetation clearance and/or soil compaction must be managed, and steps must be taken to ensure that stormwater does not lead to excessive levels of silt entering the watercourses. • The stormwater plan must include adequate attenuation facilities to ensure that peak flows do not cause negative impacts on sensitive areas. • An adequate stormwater management plan must be carefully designed and implemented to avoid erosion of topsoil on adjacent arable soils throughout all the mining phases. In this regard, special mention is made of: o Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed. o Runoff from paved surfaces should be slowed down by the strategic placement of berms; and o All overburden stockpiles and waste stockpiles must have berms and/catchment paddocks at their toe to contain runoff of the facilities. • Ensure that stormwater leaving the construction site is not contaminated by any substance, whether solid, liquid, or gas.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Clean and dirty water systems must be implemented early in the construction phase, especially down-gradient of construction areas. • Dirty water from any dirty area, including water seeping from the stockpiles or any activity, will be collected in the containment dams.			

8.2.17 Fire

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Destruction of property. • Loss of life. • Destruction of crops and livestock. • Uncontrolled/Unregulated fire that spreads to the surrounding natural Bushveld and ridge.	• To prevent open fires. • To ensure that the workforce is aware of emergency procedures in the event of an incident.	• NEMA; and • Occupation Health Safety Act.	• A fire management Method Statement must be put in place by the Contractor. The Method Statementmust be accepted by the ECO and Vametco. • Fuels or chemicals must be stored at the designated storage area. • Gas and liquid fuels must not be stored in the same storage area. • Serviced fire-fighting equipment shall be always made available and accessible and routinely inspected.	• Fire Management Plan. • Daily Checks.	• ECO; and • CEO.	• On-going during the construction phase.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• No open fires for heating or cooking must be permitted on site unless approved by the ECO and Vametco and only at designated areas. • Designated smoking areas must be provided, with bins for discarding of cigarette stumps. • Fire incidence must be reported to the ECO immediately. • Firebreaks to be implemented.			

8.2.18 Air Pollution

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Dust nuisance from excavations, Site clearing,	• To ensure proper mitigation of air pollution.	• NEM: AQ. • NEM: AQA: National Dust Control	The following activities during the construction phase were identified as possible fugitive emission sources and may impact the ambient air quality at the relevant environmental sensitive receivers:	• Inspection Report; and • Complaints register.	• ECO; and • CEO	• On-going throughout the construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
removal of topsoil and vegetation. • Exhaust fumes from construction vehicles.	• To avoid dust nuisance from excavation activities and vehicles on dirt roads.	Regulations; and • Ambient Air Quality Guidelines and Standards.	• Site clearing, removal of topsoil and vegetation. • Construction of surface infrastructure e.g., solar panels supporting structures, magnetite dump, WRD, Solar Park, TSF, PCD, RWD, barren dam etc. • General transportation and vehicle movement on site. • Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces. • No non environmentally friendly suppressants may be used as this could result in pollution of water sources Therefore, the following mitigation measures and recommendations must be put in place: **8.2.18.1 Site clearing, removal of topsoil and vegetation.** • Topsoil must not be removed during high wind conditions due to associated wind erosion heightening dust levels in the atmosphere. • Topsoil and subsoil must be stockpiled separately in low heaps.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Area of disturbance must be kept to a minimum, and no unnecessary clearing of vegetation to occur. • Topsoil must be re-vegetated to reduce exposure areas. • Stockpile any topsoil or any overburden material at least 40m outside of the outer boundary of wetlands. • Water or binding agents such as (petroleum emulsions, polymers, and adhesives) can be used for dust suppression on earth roads. • Stockpiles must not be left for prolonged periods as wind energy generates erosion and causes more dust. • Any crusting of the surface binds the erodible material. • All stockpiles to be damped down, especially during dry weather or re-vegetated (hydroseeding is a good option for slope revegetation). **8.2.18.2 Construction of surface infrastructure (e.g., access roads, solar panel supporting structure, PCD, RWD, WRD, TSF, Barren and Scrubber Dams, etc.).** • Dust emitted during bulldozing activity can be reduced by increasing soil dampness by watering the material being removed, thus increasing the moisture content.			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Material needs to be removed to dedicated stockpiles to be used during rehabilitation. • The material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers to reduce the amount of dust being blown from the load bin in the haul roads. **8.2.18.3 General transportation, hauling and vehicle movement on site.** • Hauling of materials and transportation of people must occur on roads that are being watered and/or sprayed with dust suppressant. • To mitigate the impacts of the activity, the speed limit must be kept to a low as more dust will be generated at higher wind speeds. • Speed limits need to be observed and adhered to. • The drop heights must be minimised when depositing materials to the ground. • Control techniques for fugitive dust sources generally involve watering, chemical stabilization, and the reduction			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			of surface wind speed though windbreaks and source enclosures. • Further, roads on-site more especially for the hauling of WRD and magnetite were identified as the second most significant source of dust emissions. Therefore, three types of measures to reduce emissions from unpaved roads must implemented as follows: o Measures aimed at reducing the extent of unpaved roads, e.g., paving; o Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds; and • Measures aimed at binding the surface material or enhancing moisture retention, such as wet suppression and chemical stabilization.			

8.2.19 Noise impact

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
Construction phase will generate noise from the following activities: • Site clearing and grubbing of footprint • Earthmoving activities • Excavation/drilling of foundations and associated activities.	• To ensure minimal noise disturbance • To ensure proper mitigation measures of noise. • To avoid noise nuisance from operating construction equipment.	• Noise Control Regulations (ECA); and • SANS 10103 of 2008.	Noise is expected to increase slightly as a result of the proposed activities. Therefore, the following mitigation measures must be adhered to: • Construction activities must take place during daytime period only. • Noise associated with the construction activities can be mitigated by limiting the construction operation to business hours. • Where noise becomes a nuisance, management measures will be investigated and implemented to address these. • Offending machinery and vehicles shall be banned from use on site until they have been repaired. • Use equipment with lower sound power levels. Install silencers for fans. Use mufflers on engine exhausts and compressor components. Use vibration isolation for mechanical equipment. • Any noise-related complaints must be recorded and reported to the ECO and addressed accordingly. • Workers must be provided with hearing protection as and when required.	• Noise monitoring. • A register of complaints.	• CEO; and • ECO.	• Quarterly basis during the construction phase.

8.2.20 Visual impact

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Loss of sense of place. • The presence of magnetite dump, WRD, TSF, Solar and PCDs intrudes on existing views and spoils the views of the landscape • Visual impact of new infrastructure and influence on surrounding landowners. • Disturbance of visual quality of the Landscape due to Solar Arrays	• To ensure proper mitigation measures of potential visual impacts. • To maintain the site's aesthetics.	• NEMA	The proposed activities will have impacts on visual of the surrounding residents, and motorists. Therefore, the following mitigation measures and recommendations must be implemented: • If practically possible, locate construction camps in areas the already disturbed are or where it is not necessary to remove established vegetation like for example naturally bare areas. • Utilize existing screening features such as dense vegetation stands or topographical features to place the construction camps and lay-down yards out of the view of sensitivity visual receptors. • Screen the construction camp and lay-down yards by enclosing the entire area with a dark green or black shade cloth of no less than 2m height. • All temporary structures erected on site for the purposes of the project's construction phase will be removed from site upon completion of the project.	• Inspection Report; and • Complaints register.	• ECO. • Contractor • Vametco	• On-going during the construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Lighting will be sufficient to ensure security but will not constitute 'light pollution' to the surrounding areas. • Where areas are going to be disturbed through the destruction of vegetation, for example the establishment of the construction camp, the vegetation occurring in the area to be disturbed must be replanted with endemic, indigenous species, especially veld-grass and trees. A hydroseeding application is recommended in the disturbed areas as a measure of rehabilitation. • Retain existing vegetation adjacent to the development footprint to minimise the visual impact caused by clearing vegetation and exposing soil areas. • Plant fast-growing endemic trees along the boundaries of the solar park. The trees will with time create a screen and increase the biodiversity of the area. • Make use of existing access roads where possible. • Where new access roads are required, the disturbance area should be kept to a minimum. A			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			two-track dirt road will be the most preferred option. • Locate access routes to limit modification to the topography and to avoid the removal of established vegetation. • Avoid crossing over or through ridges, rivers, or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation is not resilient and takes extended periods to recover. • Road verges that need to be cleared should be kept to a minimum. • Access routes should be located on the perimeter of disturbed areas such as cultivated/fallow lands as not to fragment intact vegetated areas. • If it is necessary to clear vegetation for a road, avoid doing so in a continuous straight line. Alternatively, curve the road to reduce the visible extent of the cleared corridor. • Avoid a continuous linear path of cleared vegetation that would strongly contrast with the surrounding landscape character. Feather the			

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			edges of the cleared corridor to avoid a clearly defined line through the landscape. •			

8.2.21 Traffic impact

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Possible traffic increase. • Car accident. • Irregular traffic impact during construction. • Impact on road safety, congestion, wear, and tear of the road surface.	• To maximise road safety and minimise congestion. • To ensure that traffic impacts because of the construction related activities are minimized.	• NLTA.	• Effective traffic control must take place throughout the construction phase. • Access roads will be maintained by the Contractor and will ensure that access roads to the site are of a suitable quality to eliminate soil erosion and channel stormwater. • Where possible strategic positioning of entry and exit points must be established to ensure as little impact/ effect as possible on the traffic flow. • Monitor adherence to traffic regulations. • Monitor drivers, for use of alcohol and other substances that could impair judgment and driving.	• Inspection Report; and • Complaint's report.	• CEO; and • ECO.	• On-going during the construction phase.

			• Ensure that loads on trucks are properly secured during transport. • Schedule arrival and departure of heavy vehicles to avoid morning and afternoon peak hours. •			

8.2.22 Excavation and Groundworks

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Erosion • Injury to humans and animals	• To prevent erosion. • To ensure safety for both human and animals.	• OHSA; and • NEMA.	While working at areas prone to erosion, the following must be adhered to: • Excavations must not be left open for longer than 14 days without soil protection measures. • Excavations must be always barricaded/ fenced off. •	• Inspection Report; and • Incident report.	• CEO; and • ECO	• On-going excavations.
• Excavation activities as part of site preparation for the magnetite dump, TSF, PCD, WRD, Solar Park,	• To reduce the impact of the magnetite dump in vegetation and soils. • To prevent seepage into the ground.	• MPRDA; • NEMA; and • NWA.	• The construction and lining of the Vametco's waste disposal facilities must be as per the DWS requirements to limit mobility of contaminants into the wetlands and groundwater regime. • Divert clean water away from the waste disposal facilities and other areas prone to hydrocarbon contamination or other spills.	• Water monitoring report. • Inspection Report. • Incident report.	• Project Engineer; and • EM.	• Quarterly.

RWD and associated infrastructure will result in removal of soil. • Compaction of soil, leading to increased runoff rate. • The magnetite dump and TSF expansion may lead to a decrease in groundwater quality through the infiltration and seepage of contaminated			• Preventing, monitoring, and mitigating emissions from unforeseen spontaneous combustion of materials TSF, magnetite dump and WRD. • Design and create berms to stop runoff from the magnetite and TSF dumps during/after a periodic extreme rainfall event to enter directly into existing washes. • Any holes/deep excavations for the Solar panels must be dug and planted in a progressive manner and shouldn't be left open overnight. • Should the holes be left overnight, they must be covered temporarily to ensure no small fauna species fall in. • Ensure that cables and connections are insulated successfully to reduce electrocution risk. • Any exposed parts must be covered (insulated) to reduce electrocution risk. •			

water resources.						

8.2.23 Soil and Agricultural Potential

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Potential loss of agricultural land capability. • Potential soil contamination. • Soil compaction. • Disturbance and loss of agricultural soil during construction. • Negative	• To avoid loss of agricultural soil • To reduce / prevent the disturbance of agricultural soil • To limit the impact on agricultural activities • To avoid undue loss of	• CARA.	During the construction, the removal or disturbance of vegetation cover will affect the soil and agricultural potential. The following mitigation measures must be implemented: • Access roads must avoid steep slopes wherever possible. • Where steep slopes are used, road stabilization measures (culverts, run-off trenches, banking of bends etc.) must be implemented. • Direct surface disturbance of the identified high clay content/wetland (i.e., Rensburg, Arcadia and Rustenburg etc.) soils should be limited within demarcated areas where possible to minimise the intensity of compaction due to the susceptibility of these soils to prolonged waterlogging conditions (inundation).	• Inspection Report; and • Complaints register.	• ECO. • EO.	• During construction.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
Impacts on agricultural activities	livestock and crops.		• Compacted soils adjacent to the mining project and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation. • Compaction of soil can be mitigated by ripping the footprint and introducing both organic and inorganic fertilizers. •			

8.2.24 Erosion and Control

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Erosion and siltation in drainage areas. • Increase the vulnerability of the disturbed areas to erosion	• To prevent erosion and sedimentation.	• NWA(36 of 1998).	• Disturbance within or near the drainage areas must be kept to a minimum. • Any roads along slopes must have water diversion structures placed at regular intervals to ensure that they do not capture overland flow and become eroded. • The Contractor shall protect areas susceptible to erosion by installing necessary temporary and / or	• Complaints register; and • Inspection Report.	• CEO; and • ECO.	• On-going particularly during excavations.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Impact on soils and habitats and sensitive environs. • Compaction of soil, leading to increased runoff rate. • Water Runoff from road surfaces			permanent drainage and by taking suitable measures to prevent surface water concentration into nearby roadways. • Stripped topsoil shall be stockpiled separately from subsoil and rocky material. Soil must be stripped in a phased manner to retain vegetation cover for as long as possible. • Stockpiled topsoil must not be compacted and must be reused as the final soil layer. • Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste, which may inhibit the later growth of vegetation and micro-organisms in the soil. • Soil must not be stockpiled on drainage lines or near watercourses. • The timing of clearing and grubbing must be co-ordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. • If topsoil will be stockpiled for a longer period, it must be either vegetated with indigenous grasses or covered with a suitable material to prevent erosion and invasion by weeds.			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• To limit the introduction of alien species into the area, no soil may be imported onto site. • Where required, cut-off trenches can be installed to divert substantial run-off and prevent erosion as and when necessary. • Where new roads are constructed, water diversion berms must be constructed to prevent erosion. • Sensitive areas such as watercourses (wetlands, drainage lines, non-perennial rivers, and riparian areas) must be cordoned off to control vehicles and construction personnel access. • Erosion Control Measures must be implemented on stockpiles where higher than 1.5m. • Regular inspections of these stockpiles should be undertaken, and any erosion damage should be repaired immediately. • Topsoil and subsoil stripping will be conducted up to a suitable depth for construction purposes, at least 400mm. Different soils must be stockpiled separately in designated areas. • The topsoil and overburden must be stockpiled in such that dust and water erosion is limited.			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Stockpiles will be constructed in such a way to ensure stability and thereby preventing the possibility of wash down. Soils which are stripped could be used in the construction of berms or other storm water management measures. • All ripped areas need to be re-vegetated with a suitable mix of plant species as determined by a qualified botanist. • All re-vegetated areas should be monitored to ensure successful re-establishment of natural vegetation and to prevent invasion by alien species. • Vegetation and soil must be retained in position for as long as and wherever possible, and only removed immediately ahead of construction / earthworks in that area (DWAF, 2005). • Topographical profiling and revegetation must take place as soon as a section is completed. • All areas susceptible to erosion must be protected (e.g., silt screens, sandbags, swales, hay bales etc.) and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and or work areas.			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Areas exposed to erosion due to construction should be vegetated with appropriate species naturally occurring in the area. • Surface water or stormwater must not be allowed to concentrate, or flow down cut or fill slopes without erosion protection measures being put in place. • Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds. • Where possible, existing access routes and walking paths must be made use of. • Speed limits must be put in place to reduce erosion. • A stormwater management plan must be compiled and implemented. •			

8.2.25 Use of cement and concrete

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Soil, surface, and ground water pollution.	• To conserve soils, surface, and groundwater • To minimise waste concrete from polluting the environment.	• NEMA (107 of 1998) • NEMWA (59 of 2008) • HSA (83 of 1993)	Cement and concrete are regarded as highly hazardous to the natural environment due to their high pH and the chemicals contained therein. To avoid pollution the following must be implemented: • Pre-mix concrete shall be the preferred option where possible. • If concrete mixing is undertaken on site, the batching / mixing area must be properly designated, indicated on the site plan and always kept neat and tidy. • No batching / mixing activities will be done on a permeable surface or bare ground. • Unused cement bags will be stored as hazardous waste and disposed of appropriately. •	• Inspection Report; and • Site Plan.	• ECO; and • CEO.	• Throughout the construction phase.

8.2.26 Social Impact

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Influx of jobseekers • Job creation and skills development. • . • Local economic development. • Increase in crime. • Increased risks of HIV infections. • Disruption of community and social infrastructure. • Transformation of sense of place	• Promote local employment.	• Basic Conditions of Employment Act; and • Vametco External Communication Policy.	• It is not possible to restrict people's movements. This impact will be more prevalent during the construction phase. • All employment opportunities should be advertised, and interviews conducted off the mine or by appointment only. • Where opportunities for local employment arise, the proper measures must be put in place to advertise and determine if the services can be supplied by local providers. • Control the inflow of workers onto the construction sites. • Develop a strategy to minimise the influx of outsiders to the area. • The company must engage the local communities and understands the basis of their grievances. • Develop a grievance mechanism as part of the community engagement plan. • Ensure appointment of local unskilled labour is prioritised to reduce the influx.	• HR • SLP	• PM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Skilled professionals such as engineers can be accommodated on-site or with local accommodation establishments. This will also contribute to local economic development. • The mine must have an SME database as part of the procurement process that can be used to outsource services. • The recruitment of professional security will play a significant role in managing crime. • Standardisation of minimum wage for unskilled labour. • Main contractors to provide guidelines with a standardised working conditions to be shared across. • Strengthen stakeholder engagement. • Security Management Plan to be implemented for the construction phase of the solar project. • Vametco must acquire a contract with the company that is responsible for recycling energy batteries and solar panels.			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Budget allocation for the decommissioning or an agreement with Eskom where the facility can be transferred. •			

8.2.27 Construction Site clean-up and rehabilitation

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Erosion. • Spread of alien invasive plant species. • Visual impact.	• Minimise damage to topsoil and environment at tower positions. • Successful rehabilitation of all damaged areas. • Prevention of erosion. • To ensure that the site is fully	• NEMBA (10 of 2004) • NEMA (107 of 1998)	• The Contractor must ensure that all temporary structures, materials, waste, and facilities used for construction activities are removed upon completion of the project. • Fully rehabilitate all disturbed areas according to an approved rehabilitation plan. • All replaced equipment and excess gravel, stone, concrete, bricks, temporary fencing, and the like shall be removed from the site upon completion of the work. • No waste materials of any nature shall be buried on the site or on any other land within the site.	• Rehabilitation Plan; and • Inspection Report.	• ECO; and • CEO.	On completion of construction.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
	rehabilitated to its original state. • To ensure that the site is clean and neat. • Minimize claims and litigation from landowners.		• Re-seeding shall be done on disturbed areas as per the Rehabilitation Plan and as directed by the Vametco EO and ECO. • Slopes more than 2% must be contoured and slopes more than 12% must be terraced. • The Contractor shall dispose of all excess material from site at a registered disposal facility. • Reusable material will be taken off site and reused elsewhere.			

8.2.1 Dust impact

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Dust fallout	• To minimise dust within the site.	• NEMA	• Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces.	• No dust complaints.	• Inspection Report.	• ECO; and • CEO.	• Construction phase.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			○ No non environmentally friendly suppressants may be used as this could result in pollution of water sources				

8.2.2 Monitoring of EMPr and compliance

Objective	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency

To implement an on-going monitoring and performance audit programme.	• The correct and successful implementation of impact mitigation measures to reduce adverse impacts on environmental aspects needs to be ensured by a proper monitoring program. • Monitoring of the general implementation of/adherence to the EMPr shall be the responsibility of the ECO. • Reporting on adherence/compliance to stipulations as communicated to Contractors, shall take place during scheduled site meetings. • Regular site meetings by the project team must be held. • Continuous induction of staff and visitors on the EMPr conditions and requirements. • Put in place non-conformance, prevention, and corrective procedures.	• Checklist. • Daily Register. • Attendance Registers. • Photographic evidence. • Audit and Monitoring Reports. • Inspection Report.	• ECO; and • CEO.	On-going post rehabilitation.

8.3 OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME

8.3.1 Mining of Vanadium

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Removal of geological vanadium and associated resources will permanently alter the geology of the area.	• Conserve geological strata.	• MPRDA	• No mitigation measures are possible, as mining permanently destroys the geological strata. • The mine will make optimal use of the Vanadium resources which forms part of the mining rights. • The mining operations will remain within the limits of the designated mining rights area.	Mining within the designated rights.	• Inspection Report.	• MM	• Ongoing
• The potential sterilisation of Vanadium resources due to the establishment of infrastructure	• To utilise all available Vanadium resources optimally.	• MPRDA	• The mine must ensure to utilise all available resources optimally. • Should additional Vanadium resources be identified outside the boundaries as stipulated within this report,	• Application for authorisation.	• Inspection Report; and • Licences/ Permits.	• MM	• Ongoing

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
on potential resources.			the necessary applications must be made to the relevant authorities, who will include, but are not limited to the DMRE (for mining and listed activities); DWS (for water related issues), National Department of Agriculture (for potential impacts on land use and capability), SAHRA (for potential impact on unidentified graves or culturally important sites).				
• Possibility for deterioration of water quality due to acid mine drainage.	• To prevent deterioration of water resources.	• NWA; and • NEMA.	• The timing, location, quality, and volume of decant that is expected to occur post-mining should be determined to allow more detailed decisions to be made regarding possible mitigation and management measures to be implemented.	• No deterioration of watercourse.	• Inspection Report; and • Sampling.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• The necessity and feasibility of treating the decanting water must also be investigated and treatment implemented.				
• Peripheral impact relating to human presence and mining related activity will lead to changes in vegetation dynamics and alternation of natural ecological processes and ecosystem functioning.	• Prevent alteration of natural ecological processes and ecosystem functioning.	• NEMBA.	• The mining operations will remain strictly within the limits of the designated mining rights area. • Implement a weed and alien invasive species eradication programme during the life of the mine in all areas.	• No ecological damage.	• Inspection Report.	• Environmental Manager.	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Contamination of clean water catchment at Shaft Area.	• Avoid clean water contamination .	• NWA.	• Construction of pollution control dams, RWDs, TSF, WRD, magnetite dump, barren , and scrubber dams, berms and trenches, and correct operation of the water balance will assist in the proper water management measures to be implemented.	• No contamination of storm water.	• Incident report. • Sampling .	• EM.	• Ongoing.
• Quantity: Dewatering will result in some inflow of groundwater into the mine which could reduce groundwater availability to users.	• Avoid groundwater reduction.	• NWA.	• Some farm boreholes will be impacted during the operational phase. • No management measures can be implemented since dewatering is consequential, but ongoing monitoring of the farm boreholes yearly will determine if any problems occur. • Modelling simulations indicate that the groundwater	• No complaints from landowners regarding water shortage.	• Complaints register. • Volume measurement • Water Balance update. • Water levels measurement	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			levels will stabilise approximately 50 years after mining stops.		• Inspection Report.		
• Quality: ABA analyses showed that acid mine drainage (AMD) formation is expected, and poor-quality leachate can occur based on the leach potential of the material. This can influence the water quality in the surrounding aquifers.	• Prevent groundwater contamination from leachate.	• NWA • NEMA • MPRDA.	• Limited measures can be applied to the possible leachate of sulphate and AMD development. • Implement a groundwater monitoring network to assess and document the influence the mining operations might have on groundwater resources and groundwater quality for surrounding landowners.	• No contamination of water resources from AMD.	• Complaints register. • Inspection Report; and • Sampling.	• EM	• Ongoing

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
However, groundwater flow directions will be directed towards the mining area and contaminant migration away from the mining area will be limited during active mining. • Groundwater contamination from leachate during active mining.							
• Activities related to mining and operation of	• Reduce noise pollution from mining activities.	• MHS. • NEMA. • Noise Control	• Noise monitoring to be done regularly at the abutting residential areas in the vicinity of the proposed	• No noise pollution. • No complaints from	• Complaints register; and • Inspection Report.	• EM.	• When appropri ate.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
proposed activities will cause noise pollution to the surroundings.		regulations. • SANS 10103 of 2008.	magnetite dump and TSF expansion as well as the development of the WRD, PCDs, RWD and Barren Dam. • Actively manage the proposed mining extension activities and the noise management plan must be used to ensure compliance to the noise regulations and/or standards. • Implementation of the noise mitigatory measures and the noise management plan. • Selecting equipment with lower sound power levels; Installing suitable mufflers on engine exhausts and compressor components; Installing acoustic enclosures for equipment causing	landowners with regards to noise from mining activities.			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			radiating noise; Installing vibration isolation for mechanical equipment. • Re-locate noise sources to areas which are less noise sensitive, to take advantage of distance and natural shielding; Taking advantage during the design stage of natural topography as a noise buffer. • Develop a mechanism to record and respond to complaints. • Implement regular noise monitoring to be done to ensure that operation noise is within acceptable standards.				
• Possibility of decreasing water quality.	• To prevent water quality deterioration.	• NWA.	• Water resources must be monitored on a regular basis. No dirty water must be allowed to leave the mine.	• No water quality deterioration.	• Inspection Report; and • Water Quality	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			Any detected deterioration of water quality must be immediately investigated, and action measures introduced to prevent water contamination. • Implement and maintain surface water and groundwater monitoring network.		sampling/Tests.		
• Increase potential of fires.	• Prevent fries.	• NEMA.	• Control of contraband going underground. • Access of workers onto mine property to be controlled, access to underground workings should be under strict supervision.	• No veld fires.	• Incident report; and • Inspection Report.	• PM	• Ongoing.
• Increase in sexual transmitted diseases.	• To reduce the spread of sexually transmitted diseases	• OHSA.	• HIV awareness campaigns must continue. • Education Programmes and Health Education programmes must be held	• Reduction in the spread of sexually transmitted diseases.	• Inspection Report; and • Incident.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			regularly and during induction.				
• Increased temperature, heatwaves, and wildfires.	• To prevent increased temperature and wildfires due to climate change.	• NEMAQA; and • Climate Change Bill.	• The risk and management of heat related illnesses should be integrated with the Occupational Health and Safety Plans. • Measures may include monitoring of temperature and humidity levels, providing adequate cooling and ventilation, introducing systems to limit exposure to heat, and educating staff to recognise early symptoms of heat stress. • The risk of wildfires in relation to infrastructure and facilities should be assessed. Adequate monitoring, fire detection, and suppression	• No wildfires; and • No records of extreme temperatures.	• Inspection Report; and • Incident report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			systems should be implemented.				
• Water scarcity and drought.	• To avoid depletion of water resource.	• NWA. • Climate Change Bill.	• Regular monitoring of operational water requirements and available resources should be conducted. • A contingency response plan should be developed in the event of short, medium, or long-term water shortages. • A Water Management Strategy should be developed as to manage and minimise water usage, setting clear objectives and targets to improve efficiency. • A contingency response plan should be developed if water quality deteriorates. Measure may include additional water	• No lack of water.	• Water monitoring report; and • Inspection Report.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			treatment infrastructure development. • A contingency response plan should be developed for dust suppression in the event of dry spells and periods of elevated dust generation. • Community participation should be considered with regards to water infrastructure and management.				
• Floods, cyclones, and storms.	• To minimize the occurrence of floods, cyclones, and storms. • Minimize damage cause by floods,	• Climate Change Bill • NWA	• A site-specific flood risk assessment should be conducted to identify areas vulnerable to flooding. • A risk assessment should be conducted to assess the flood risk in relation to key access roads. • A contingency response plan should be developed should	• No damage caused by floods.	• Flood risk assessment; and • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Index	Monitoring Criteria	Responsible Agent	Monitoring Frequency
	cyclones, and storms.		operations become inaccessibility due to floods.				
• High wind speeds and gusts.	• To minimize impact caused by high wind speeds and gusts.	• NEMAQA • Climate Change Bill.	• A continuous monitoring station should be installed to obtain site-specific wind data. • Regular maintenance checks for wind-related damage should be performed.	• No damage to infrastructure.	• Weather station.	• EM	• Ongoing

8.3.2 Control of Clean and Dirty Water Systems

The following Management Measures and Action Plans relate to the following activities associated with:

- Operation and maintenance of pollution control structures.
- Operation and maintenance of the stormwater management system.; and
- Operation of monitoring systems.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Concentration of flows along proposed activities (i.e., magnetite dump, slimes dam, RWD, PCD etc and around the surface infrastructure will have an impact on environment.	• To reduce impact on the environment	• NEMA • NWA	• Discharge points for clean stormwater and treated effluent should include erosion protection measures as well as energy dissipaters. They should diffusely release flows to encourage dispersion across the full extent of the sensitive areas. • Adequate stormwater control and management must be practiced ensuring that contaminants are not introduced into water resources. • The construction of surface stormwater drainage systems during the operational phase must be done to protect the quality	• No impact on the environment • No visible erosion	• Inspection Report	• EM	• Ongoing

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			and quantity of the downstream system. • Ensure building materials are not dumped or stored within the proximity of the watercourse. • Discharge points should regularly undergo maintenance checks and any erosion damage repaired as well as accumulated debris removed. • A maintenance plan of the pollution dam structures shall be compiled.				
• Deterioration in water quality.	• To reduce impact on water quality.	• NWA.	• Clean and dirty water should always be kept separate. No dirty water may be discharged into any watercourse on site.	• No deterioration of water quality.	• Inspection Report. • Water monitoring reports.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Regular maintenance and inspection of the water infrastructure will need to be undertaken. • Treated water on-site should meet the applicable DWS standards (minimum standard for aquatic ecosystems and livestock watering) before release into any natural water body or wetland on site. • Surface water quality and SASS5 monitoring must be conducted regularly.				
• Decrease in flows.	• To minimise impact on water flows.	• NWA.	• Discharge points should regularly undergo maintenance checks and any erosion damage repaired and accumulated debris removed. entire	• No reduction in flows.	• Inspection Report. • Water monitoring reports.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Discharge of stormwater into environment and watercourse.	• To reduce impact on watercourse.	• NWA. • NEMA	• All areas likely to cause pollution should be located within the dirty water area. • Stormwater discharge points should be protected against erosion and should include energy dissipaters and be maintained to ensure the optimal function. • Flow velocity at the point of discharge should not exceed 0.05m/s.	• No negative impacts on watercourse.	• Inspection Report.	• EM	• Ongoing.
• Peripheral impact relating to human presence and mining related activity will lead to changes in vegetation dynamics and alternation of	• To reduce ecological impacts and ecosystem functioning.	• NEMBA	• The mining operations must remain strictly within the limits of the designated mining rights area.	• No damage to ecology.	• Inspection Report.	• EM	• Ongoing

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
natural ecological processes and ecosystem functioning.							
• Leaking storage facilities will result in a loss of water and will impact the water availability of the mine.	• To prevent water loss.	• NWA.	• The water storage facilities will be regularly monitored for leaks and siltation and will be adequately maintained. • A detailed surface water monitoring programme will be implemented.	• No reduction in water availability.	• Water monitoring report. • Inspection Report.	• EM	• Ongoing.
• Stream flow reduction will be caused by separating the clean and dirty water through berms and trenches.	• To prevent reduction of streamflow.	• NWA.	• Ensure the dirty water catchment area is as small as possible to avoid unnecessary losses to the streamflow.	• No reduction in streamflow .	• Inspection Report • Water monitoring report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Poor quality seepage may occur into the underlying strata if the dams are situated on permeable soil formation or on a groundwater flow path like dykes and/or faults systems. Overflow of dams can also result in down-stream contamination of surface water bodies and seepage	• To avoid seepage of leachate into underlying strata.	• NWA.	• Lining of all Pollution Control Dams and RWD and magnetite dump and TSF should be regularly monitored and checked to mitigate the possibility of seepage. • Dam levels will be kept at the required levels. • Surface water monitoring and groundwater monitoring programme must be maintained during operation.	• No water contaminatio n.	• Inspection Report. • Complaints register. • Water monitoring report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
into groundwater.							
• Possibility of decreasing water quality.	• To prevent water contamination.	• NWA.	• Water resources must be monitored on a regular basis. • No dirty water must be allowed to leave the mine. • Any detected deterioration of water quality must be immediately investigated, and action measures introduced to prevent water contamination. • All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimized, and be surrounded by bunds. • Erosion control of all banks must take place to reduce	• No water contamination.	• Water monitoring reports • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			erosion and sedimentation into wetland areas.				

8.3.3 Operation of the Solar Park

The following Management Measures and Action Plans relate to the following activities associated with

- Operation and maintenance of Solar PV.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Collisions with infrastructure associated with the PV Facility. • Electrocution due to infrastructure associated with the PV Facility. • Direct mortality from road kills, persecution or	• To reduce impact on the environment	• NEMA	• Outside lighting should be designed and limited to minimize impacts on avifauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (red/green) lights should be used wherever possible. • All maintenance motor vehicle operators should undergo an	• No impact on the environment • No visible erosion	• Inspection Report	• EM	• Ongoing

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
poaching of avifauna species and collection of eggs. • Direct mortalities and hinderance of movement from fencing infrastructure. • Pollution due to chemicals used to keep the PV panels clean.			environmental induction that includes instruction on the need to comply with speed limit (20 km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited. • Fencing requirement for ClearVu or similar fencing: ○ If needed, any top strands must be smooth wire, barbed wire must be avoided; ○ Routinely monitor all fencing for any collisions and mortality, as well as trapped fauna. ○ Place markers/diverters on fences, especially towards the top ○ A specialist must be consulted if any collisions or mortalities are observed.				

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			○ Conventional fencing mitigations: ○ Top 2 strands must be smooth wire ○ Routinely retention loose wires ○ Minimum 300 mm between wires ○ Place markers on fences. • Post-construction monitoring should follow the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017). If monitoring results indicate excessive bird fatalities, then adaptive mitigations should be implemented. Before implementation, these should be discussed with the avifaunal specialist and ECO and could include the				

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			retrofitting/incorporation of additional visual cues/diverters to existing PV panels/infrastructure. • As far as possible power cables within the project site should be thoroughly insulated and preferably buried.				

8.3.4 Waste Generation and Handling

The following table indicates Management Measures and Action Plans associated with:

- Operation and maintenance of waste management systems (domestic)
- Operation and maintenance of the proposed waste disposal facilities (mine wastes facilities i.e., magnetite dump, Solar Park, WRD and TSF).
- Collection and handling of waste from workshops (domestic and hydrocarbons).
- Collection and handling of waste from the offices and change houses (domestic).
- Operation and maintenance of diesel storage areas.
- Collection, handling, and storage of other domestic and hazardous waste identified.

8.3.4.1 Mine Waste (magnetite, tailings, and waste rocks)

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• The stockpiling, dumping, and pumping of material as result of operational activities will impact on the micro and macro topography due to the construction of the waste disposal facilities.	• To prevent impact on the environment.	• NEMA.	• The waste disposal facilities (Magnetite dump, TSF, WRD, PCD, RWD and Barren as well as the scrubber dams) must be designed with the mind on closure. The co-disposal facilities should be shaped to blend in with the surrounding topography as far as possible. • Waste management must be a priority and all waste must be collected andstored effectively. • The Mine should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility.	• No negative impact on the environment .	• Inspection Report.	• EM.	• Ongoing .
• Erosion with regards to the	• To prevent erosion.	• CARA; and	• Vegetation establishment in disturbed areas will be	• No visible erosion.	• Inspection Report.	• EM.	• Ongoing .

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
disposal facilities.		• NEMA.	undertaken as soon as practically possible. • Where disturbed areas cannot be revegetated during the life of operations, appropriate erosion control measures (i.e., dust allying agent, terraces, rock cladding, etc.) must be implemented. • Erosion control measures are required on all slopes exceeding 2% and engineering erosion control measures are required on all slopes exceeding 15%. • The mine will ensure that all erosion controls are included in the designs of all linear infrastructure (power lines, pipelines, etc.) and points of water discharge. • Areas, where erosion control measures have been				

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			implemented, must be inspected on a weekly basis to determine the effectiveness.				
• Soil physical and chemical degradation as result of the disposal facilities and possible spillages that might occur during operations.	• To prevent soil contamination .	• CARA. • NEMA.	• There will be an incident management system including procedures and training for dealing with incidents. • Major spillage incidents must be reported to the DMRE, DWS, and the Department of Agriculture. • Appropriate remedial measures will be implemented in consultation with these regulatory authorities. • If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with qualified specialist. If necessary, the polluted soils will be classified as waste and will be	• No soil contamination.	• Incident report; and • Inspection Report.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			discarded at a permitted waste site. • After the removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. • A detailed waste management strategy will be established and implemented. • Best waste management practices should be emphasized during the induction phase and on an ongoing basis. • Waste should be removed by licensed waste disposal companies. Once the designated areas for waste skips and the planned amounts have been finalised the mine has to obtain a Section 19 Application in terms of the National Environment				

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			Management: Waste Act. 2008 (Act No. 59 of 2008).				
• Deterioration of water quality due to oxidation and leaching of pyretic material during storage on site, releasing low pH, high metal, and sulphate rich discharges into the surface water watercourses.	• To prevent pollution of water resources.	• NWA. • NEMWA.	• A waste characterization test should be undertaken prior to the disposal of any type of mine wastes. • The surface of the disposal area should be compacted to reduce the potential of infiltration. • Berms/drainage channels and cut-off trenches should be constructed both below and above stockpiles to enable the separation of clean and dirty water. • Should a pollution plume be detected, an action plan should be enforced immediately to pump and treat the polluted water. • Groundwater monitoring boreholes must be placed	• No pollution of water resources.	• Inspection Report • Water monitoring report. • Waste characterisation report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			strategically around all disposal sites. • The surface water quality of surrounding streams must be monitored continuously. • Should the contamination of water resources be detected an action plan should be enforced immediately to rehabilitate the situation.				
• Increase in alien invasive species. Due to the disturbance of the mining activities, and all other infrastructure, the potential for the spreading of invasive alien plant	• To prevent the spread of alien invasive species.	• NEMBA	• A plan to eradicate all invasive alien species must be established on-site. The plan will be implemented in a phased approach.	• No alien invasive species.	• Alien invasive monitoring plan. • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
species increases.							
• The fine material from the mine wastes stockpiles can be transported to watercourses and lead to the contamination thereof.	• To prevent contamination of water resources.	• NWA	• Ongoing rehabilitation must be undertaken to ensure that no erosion of the side slopes takes place as practical as possible. • Polluted water at the bottom of the dumps must be captured and pumped or gravitated to the pollution control dams through dirty water drains.	• No contamination of water resources.	• Water monitoring report. • Inspection Report.	• EM	• Ongoing.
• Contamination of surrounding groundwater from the disposal facilities.	• To prevent contamination of groundwater.	• NWA	• Management measures must be put in place to reduce seepage through the base of the disposal facilities also under the WRD stockpile and the RoM stockpiles. • The ongoing monitoring and reporting programme must be followed. The ongoing reporting on groundwater levels must be	• No contamination of groundwater.	• Groundwater monitoring report. • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			undertaken throughout all stages of the project. • If the mine impacts water quality or quantity, water must be supplied to water users if the groundwater study proves that the mine impacts the groundwater. Water must be of similar quality used before the mining activities. • Clean and dirty water systems must be maintained to ensure that it remains effective. • The clean and dirty water systems must be kept in good conditions to ensure that aquifers are not polluted by dirty water, and that there will be no further adverse effects on the groundwater aquifers.				

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• The increase in dust dispersion around the disposal facilities and associated activities.	• To reduce dust generation.	• Dust regulations. • NEMA QA.	A dust management plan that includes the following mitigation measures must be implemented on the mine: • Water sprays must be used in the loading of stockpiles (50% reduction). • Should emissions continue to exceed the guidelines the enclosure to the loading stockpiles should be investigated. • Erosion control measures should be employed and maintained at all dumps and stockpiles. • Ongoing ambient and PM10 monitoring must be implemented with dust monitors.	• No dust generation.	• Dust Management Plan. • Dust monitoring report. • Inspection Report.	• EM	• Ongoing.
• Visual impact of mining activities	• To reduce visual intrusion.	• NEMA	• Very little mitigation is possible during the operational phase, but several management measures can be put in place to minimise	• No visual intrusion.	• Inspection Report.	• PM • EM	• Ongoin

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			the overall effect and make rehabilitation easier. • To restore the visual quality of the landscape, it is suggested that a comprehensive rehabilitation plan be developed based on the principles of ecological restoration. • Harsh, steep engineered slopes will be avoided as these could impose an additional impact on the landscape by contrasting with existing natural topographic forms and because it is challenging to sustain vegetation on steep slopes in the long term. • Visual barriers (i.e., indigenous trees) could be planted to reduce the visual impact on surrounding areas. • Avoid construction material with bright colours with high reflection				

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			values. Grey to olive green colours in a matt finish contributes to the assimilation of features with natural backgrounds.				
• The possible impact on site of historical and cultural significance.	• To prevent negative impact on cultural sites.	• NHRA • NEMWA • NEMA	The Heritage Impact Assessment were undertaken, and the graves were identified at the area of the proposed TSF expansion and RWD development. Therefore, the following must be adhered to: • The approximately 30 graves identified must be relocated. • Should any other graves or other sites with potential historical and/or cultural importance be identified, all activities in that vicinity must cease immediately. • The mine environmental and safety and health office must be informed. The area must be cordoned off. An archaeologist	• No impact on sites of historical and cultural significance.	• Complaints register • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			should be informed immediately to investigate and inspect the site to determine the importance. Should a grave be found, the Heritage Resource Authority (HRA) officer should be contacted immediately.				

8.3.4.2 Waste Generation

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• The use of diesel, oil and other hazardous chemical substances may lead to the	• To prevent contamination of soil.	• CARA • NEMA • NEMWA • HSA	• All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored. • Spill kits should be readily available, and all employees must be trained in the utilisation thereof. • Should a spill take place, the area should be cleaned immediately,	• No spillages of hazardous chemicals.	• Incident report. • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
contamination of soils.			and the contaminated area will be rehabilitated as appropriate. If a major spill could result in major soil and water contamination, the DWS should be informed immediately, and a remediation strategy should be enforced., • Employees will be educated through training and the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by implementing good housekeeping practices. The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme. • The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme.				

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may be undertaken outside of an effectively designed contained area. • Should there be a need for mobile toilets, they must be provided at a ratio 1:15 and serviced according to the waste management method statement.				
• The generation of waste may lead to soil contamination.	• To prevent contamination of soil.	• HSA. • NEMWA.	• A detailed waste management strategy will be established and implemented, which will demarcate the containments for different waste types. These containments will be colour coded. • The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner. • Littering and contamination of water sources during mining activities	• No spillages of hazardous chemicals.	• Incident report. • Inspection Report.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			must be mitigated by effective camp management. • Regular safety checks and maintenance of the storage tanks must be undertaken by suitably qualified safety officers. • In addition, the storage tanks, and any other areas where spillages and leakages could occur, should be contained within a bunded area. • Any rainfall and stormwater collected within the bunded area should remain separate and need to be treated to an acceptable level before release. • It is recommended that the Environmental Best Practice Specifications published by the DWAF (Integrated Environmental Management Series, Environmental Best Practice Specifications: Operations, Edition				

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			3, DWAF 2005) be adopted for this development.				
• The improper storage procedures of diesel, oil and other hazardous chemical substances may lead to the contamination and of destruction of flora and fauna.	• To prevent destruction of flora and fauna by hazardous chemicals.	• HSA; • NEMBA; • NEMA; and • NEMWA.	• Areas used for storage and handling of waste must restricted to limit the accessibility of the area for any fauna. • All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored. • Spill kits should be readily available, and all employees must be trained in the utilisation thereof. Should a spill occur, the area must be cleaned immediately, and the contaminated area rehabilitated as appropriate. • Employees will be educated through training and the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the	• No damage to flora and fauna due to chemicals.	• Incident report. • Inspection Report. • Toolbox talk.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			implementation of good housekeeping practices. • The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme. • In the event of a major spill potentially resulting in soil and water contamination the DHSWS must be informed immediately, and a remediation strategy enforced. • No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may be undertaken outside of an effectively designed contained area.				
• The handling and storage of fuel creates a fire risk. This could	• To prevent uncontrolled fires.	• NEMWA; • HSA; • NEMBA.	• There must be sufficient fire-fighting equipment. This equipment must fulfil the South African Occupation Health and Safety requirements. All vegetation	• No fires.	• Incident report. • Inspection Report.	• EM	• Ongoing.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
negatively impact the local fauna.			adjacent to the fuel storage tanks will be continually removed. • All provisions relating to fire safety will be related during the induction and awareness training programme.				
• The generation of waste may lead to surface water contamination.	• Prevent surface water contamination by waste.	• NEMWA. • NWA.	• A surface water monitoring programme will be developed and implemented. • The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner.	• No surface water contamination.	• Inspection Report. • Water monitoring report.	• EM.	• Ongoing.
• The use of diesel, oil and other hazardous chemical substances may lead to the contamination	• Prevent surface water contamination by waste.	• NEMWA. • NWA. • HSA.	• A surface water monitoring programme will be developed and implemented. • All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored.	• No surface water contamination.	• Inspection Report • Water monitoring report.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
of surface water.							
• Hazardous chemical spills as well as seepage from the workshop and wash bay may reach groundwater, thereby impacting its quality.	• To prevent groundwater contamination from hazardous chemical	• HSA. • NWA. • NEMA.	• Good housekeeping practices will be in place to prevent accidental spillage.	• No contamination of groundwater.	• Water monitoring report. • Inspection Report.	• EM.	• Ongoing.
• Waste accumulation may have a negative visual impact.	• Prevent visual intrusion.	• NEMWA.	• A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste types. These containments will be colour coded. • Waste management will form a detailed component as part of the induction process provided by the mine.	• No visual impact resulting from waste.	• Inspection Report. • Waste characterisation report.	• EM.	• Ongoing.

Possible Impact	Objective	Applicable Legislation/ Policy	Mitigation / Management Action	Performance Indicator	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner and must be stored in a designated area as part of the waste management strategy.				

8.4 DECOMMISSIONING PHASE

The mine \ equipment associated infrastructure would be decommissioned once it has reached the end of its economic life. The decommissioning activities would need to comply with the relevant legislation at the time.

8.4.1 Removal of Infrastructure

Following cessation of mining and processing, it is planned that all infrastructures will be decommissioned and removed from the site in a systematic and regulated manner. The following activities will be conducted during the decommissioning and closure phase of the project:

8.4.1.1 Buildings

- All infrastructure will be removed, and the area rehabilitated, should no alternative use be found for the structures.
- Foundations will be removed to a depth of 1m below surface.
- An alternative use for the brick structures will first be sought i.e., they can either be sold/donated to the post-mining landowner on sale of the land. If an alternative use cannot be found, the buildings will be demolished.
- All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, sold as scrap, or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).

8.4.1.2 Linear infrastructure

- Linear infrastructure constructed by the mine will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for future mining operations as determined by Vametco or for social investment opportunities, this will be decided in conjunction with Integrated Development Plan (IDP) of the area and the local authorities (i.e., municipality). The soils and land capability will be rehabilitated to near pre-mining conditions.
- All roads will be rehabilitated by ripping these structures to a depth of 500mm.

- All fences erected around the mine and linear infrastructure will be dismantled and either disposed of at a permitted disposal site or sold as scrap (provided these structures will no longer be required by the post-mining landowner). Fences erected to cordon-off dangerous excavations will remain in place and will be maintained as and when required.

8.4.1.3 Dams

- All PCDs, barren and scrubber dams and RWD will be maintained to ensure that no leakages occur.
- Overflow pipes will be kept clean.
- Sumps will be kept clean, and all pumps will be maintained.
- The PCDs, RWD, and Barren and scrubber dams will only be demolished should the area proof to be free draining with no pollution potential after rehabilitation.

Table 25: Decommissioning phase

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• **Waste**						
• The removal of all infrastructures will produce waste, which may lead to soil contamination.	• To prevent soil contamination.	• NEMWA (59 of 2008) • GN1147	• The detailed waste management strategy implemented during construction and operation must be implemented. • Use plan that will clearly demarcate the containments for different waste streams. These containments will be colour coded. • The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in a prescribed and correct manner.	Inspection Report.	• EM	• During decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• **Hazardous substances**						
• The utilisation of hydrocarbons and other chemicals during the removal of infrastructure may lead to the contamination of soils.	• To prevent soil contamination.	• NEMWA • HSA	• All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored. • Spill kits should be readily available, and all employees must be trained in the utilisation thereof. Should a spill take place the area should be cleaned immediately, and the contaminated area will be rehabilitated as appropriate. • Employees will be trained on the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the implementation of good housekeeping practices. The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme. • The management of chemicals and hydrocarbons forms part of the emergency preparedness and response programme.	• Inspection Report	• EM	• During decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• In the event of a major spill that could result in major soil and water contamination the DWS should be informed immediately, and a remediation strategy should be enforced. • No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may be undertaken outside of an effectively designed contained area. • .			
• The decommissioning activities may lead to increased sediment movement off the site.	• To reduce sediment movement due to decommissioning activities.	• CARA • NEMA	• Decommissioning activities should as far as possibly take place in winter. • Clean and dirty water systems should be maintained until closure or when the area is self-draining. • No movement of sediments off site.	• Inspection Report.	• EM	• During decommissioning.
• **Ecology (Flora and Fauna**						
• Increase in alien invasive species. Due to the removal	• To prevent distribution of	• NEMBA	• The mine will maintain the regular weed-control programme to eradicate existing invader plants and to prevent new invasions	• Alien Invasive	• EM	• During decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
of infrastructure activities, the potential for the spreading of invasive alien plant species increases.	alien invasive species.		during ongoing mining operation and decommissioning.	Management Plan. • Inspection Report.		
• **Surface water**						
• The removal of infrastructure could lead to an increase in volume and speed of surface water run-off should management measures not be maintained which will increase the erosive capacity of the water and lead to additional siltation.	• Reduce water velocity and erosion. • To avoid groundwater seepage and contamination.	• CARA • NEMA	• Clean and dirty water systems will be maintained throughout the life of mine and continue to operate during decommissioning activities. • Vegetation must be replaced during decommissioning to ensure no bare soil surfaces are left that will increase possibility of siltation. •	• Inspection Report. • Water monitoring report.	• EM	• During decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Contamination of surface water due to the generation of waste during removal of infrastructure and the use of hydrocarbons.	• To avoid surface water contamination .	• NEMWA • NWA	• The detailed waste management strategy implemented during construction and operation must be continuously implemented. All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored. • Spill kits must be readily available, and all employees must be trained in the utilisation thereof. Should a spill take place the area should be cleaned immediately, and the contaminated area will be rehabilitated as appropriate. • Employees will be trained on the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the implementation of good housekeeping practices. The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme. • No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may	• Water monitoring report. • Inspection Report. • Incident report.	• EM	• During decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			be undertaken outside of an effectively designed contained area. • The management of chemicals and hydrocarbons forms part of the emergency preparedness and response programme. • In the event of a major spill that could result in major soil and water contamination the DWS should be informed immediately, and a remediation strategy should be enforced.			
• The removal of infrastructure will improve the visual quality. (Positive).	• To improve visual aesthetics.	• NEMA.	• Plant fast-growing endemic trees around the proposed activities. The trees will with time create a screen and increase the biodiversity of the area. • The mine will investigate an appropriate seed mix for the rehabilitation purposes should self-succession not establish on rehabilitated sites. • An ecological approach to rehabilitation and screening measures, as opposed to a horticultural approach to landscaping, will be adopted. For example, communities of indigenous plants enhance biodiversity and blend well with existing vegetation. Attempts	• Inspection Report.	• EM	• During decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			will be made to restore the natural character of the landscape.			
Noise						
• Decommissioning activities will cause further noise pollution to the surrounding residents and environment. However, this activity is temporary.	• To reduce noise impact.	• Noise Regulations • NEMA.	The implementation of noise mitigatory measures will ensure that the impact will remain low. Such measures include: • All noise management measures implemented during operational phase • Machinery with low noise levels which complies with the manufacturer's specifications to be used.	• Complaints register. • Inspection Report.	• EM	• During decommissioning.
Land						
• Loss of agricultural land due to dismantling and decommissioning of infrastructure and buildings, backfilling and	• To prevent decreasing resale value of farms.	• Land Act. • NEMA.	• During the decommissioning phase the footprint should be thoroughly cleaned, and all building material removed to a suitable disposal facility or alternatively reused.	• Negotiations.	• EM	• During decommissioning

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
reshaping of the topography. • Revegetation.						
Air quality						
• Demolition and Removal of all infrastructure (incl. transportation off site). • Rehabilitation (spreading of soil, revegetation, and profiling/contouring).	• To reduce the impact on ambient air quality.	• NEM: AQ; • NEM:AQA: National Dust Control Regulations; • Ambient Air Quality Guidelines and Standards	• Demolition must not be performed during windy periods, where possible, as dust levels and the area affected by dust fallout will increase. • The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. • Plants used for revegetation must be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. **Additional mitigation measures include all measures specific during the operational phase.**	• Dust monitoring; • Complaints register; and • Inspection Report	• EM	• During decommissioning

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. • Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion. • Plants used for revegetation must be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. • The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. • Spreading of soil must be performed on less windy days. • The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation.			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
			• The rehabilitation by vegetating must begin during the operational phase already as the objective is to minimise the erosion. • These measures must be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.				
Disposal of the damages battery, and old panels, and the decommissioning of the plant as part of the mining rehabilitation plan	• To reduce water contamination by chemicals from batteries.	• NEMA	• Vametco must acquire a contract with the company that is responsible for recycling energy batteries and solar panels. • Budget allocation for the decommissioning or an agreement with Eskom where the facility can be transferred.	• No water and soil contaminatio n	• Inspection Report.	• EM	• During decommi ssioning.
• Direct mortality due to infrastructure including collisions	• To protect avifauna species.	• NEMA	• Areas that are denuded during construction need to be re-vegetated	• Infrastructure removal	• Inspection Report.	• EM • EO	• During decommi ssioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
with PV infrastructure, fences etc • Continued habitat degradation due to Invasive Alien Plant encroachment and erosion. • Direct mortality due to earthworks, vehicle collisions and persecution			with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type. • There is little to no information on the recovery of the avifauna community subsequent to the closure of Solar PV facilities within South Africa. A post-closure monitoring regime is recommended for the			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			proposed project to document any impacts and this data must be used for improving rehabilitation measures. • All infrastructure including powerlines must be removed if the facility is decommissioned.			

8.4.2 Landscaping and Rehabilitation

The following Management Measures and Action Plans relates to activities associated with:

- Recovery of all saleable infrastructure.
- Demolition and removal of all buildings and structures.
- Ripping of all compacted areas, which will be followed with amelioration and vegetation.
- Ensure that all remaining piles and slopes are sufficiently shaped to blend in with the surrounding environment.
- Amelioration and vegetation of all disturbed areas.
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover.
- Monitoring of key environmental variables (i.e., soils, vegetation, groundwater, and surface water) to demonstrate stability during decommissioning of rehabilitated areas; and
- Weed management after closure, limited to areas disturbed by mining or included as infrastructure related to the mine.

Table 26: Landscaping and rehabilitation phase

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Ripping and topsoil replacement will restore the soil physical characteristics prior to re-vegetation. This is a positive impact to the environment. With the completion of the rehabilitation, wetland function will slowly improve as the	• To promote revegetation on site.	• NEMBA.	• Compacted soils will be ripped, and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. • The recovered soils should be re-used to rehabilitate the mine footprint following mine closure. • During rehabilitation replace soil to appropriate soil depths in the correct order, and cover areas to achieve an appropriate topographic aspect and attitude to achieve a free draining landscape that is as close as possible the pre-mining land capability rating as possible. • A short-term fertilizer programs should be based on the soil chemical status after levelling and should consists of a pre-seeding lime and fertilizer application, an application with the seeding process as well as a maintenance application for 2 to 3 years after rehabilitation or until the area can be declared as self-sustaining by an appropriately qualified soil scientist.	• Inspection Report.	• EM	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
disturbances will be reduced.							
• Increased sediment movement off the site.	• To prevent sediment movement off site.	• CARA • NEMA	• All decommissioning activities should be undertaken towards the end of winter and before the onset of the first summer rains as this would markedly reduce the likelihood of erosion caused by surface run-off and rainfall. • Decommissioning activities should also be limited to the 15m wide servitude as far as practically possible. In addition, all bare soil areas should be ripped and revegetated as soon as possible following completion of decommissioning activities. • Re-vegetated areas should be monitored to ensure successful establishment of natural vegetation, and all alien vegetation should be removed from these areas, with long-term follow up.	• No visible erosion.	Inspection Report.	• EM	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Site compaction.	• To prevent compaction of soils on site.	• CARA.	• All areas not directly within the footprint of the proposed infrastructure where the soil has been compacted will need to be ripped to break up the compacted soil surface. This will aid infiltration and decrease run-off. All ripped areas need to be revegetated with a suitable mix of plant species as determined by a qualified botanist. All re-vegetated areas should be monitored to ensure successful re-establishment of natural vegetation and to prevent invasion by alien species.	• No compaction.	• Inspection Report.	• EM	During rehabilitation.
• Re-vegetation will be undertaken on the decommissioned and rehabilitated areas before mine closure.	• Improve revegetation during decommissioning.	• NEMBA.	• Compacted soils will be ripped, and topsoil will be replaced. After the topsoil has been replaced the area should be ameliorated and seeded, should self-succession of vegetation not take place. Only species indigenous to the area will be included. Remove alien vegetation post decommissioning, with long term follow-up afterwards.	• Revegetation on site.	• Inspection Report.	• EM	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
This will be a positive impact to the flora and fauna of the area.							
• Runoff from rehabilitated areas will impacts on watercourses especially during intensive rainstorms especially if the area is not free draining.	• To reduce runoff from rehabilitated areas.	• CARA. • NEMA.	• Berms, should they be necessary, must remain upstream and downstream of the dumps and stockpiles to ensure that clean water is kept separate from dirty water until the area is free draining and re-vegetation has occurred.	• No visible erosion.	• Inspection Report.	• EM	• During rehabilitation.
• Groundwater quantity: Groundwater levels in the	• To prevent groundwater	• NWA.	• Farm boreholes will be impacted on during operational phase. This will continue for another 10 years until groundwater levels will recover to pre-	• No reduction in groundwater quantity.	• Water monitoring report.	• EM	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
mining area will start to recover when the mine dewatering stops. This will lead to the re-establishment of the groundwater levels, flow directions and flow gradients to near pre-mining levels. This will re-establish the base flow rates within	reduction.		mining conditions. Impact on regional stream flow will be minimal and will return to conditions approximately 20 years after closure. Boreholes that will not be used by any farming activities after the mine closed will be plugged to ensure the safety thereof and that no unauthorised use of the water will occur.	• Inspection Report. • Complaints register.		

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
the zone of influence. Negative: contaminants might lead to decant and migrate away from the area. Will take approximately 20-25 years to recover.							
• Quality: Mining occurs in deep elevations, especially toward the southwest and seepage	• To prevent groundwater contamination from decant.	• MPRDA • NEMA. • NWA.	• The mined-out areas should be allowed to be submerged as soon as practically possible, this will displace oxygen and stop oxidation of the minerals. • The impact is difficult to effectively mitigate and is dependent on the natural rock characteristics. Ideally a sufficient barrier should be left along the outside ridge of the pre body to stop	• No groundwater contamination • Complaints from water users.	• Water monitoring report. • Complaint register.	• EM.	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
from underground workings will be limited by low permeability of sandstone layers. Impact on surrounding aquifer will be small. Decant of poor-quality water into the stream/river system will be highly unlikely.			seepage along the coal / sediment contact to daylight. • All infrastructure, product stockpile areas and the remaining footprint will be cleared.				
• The rehabilitation (ripping, topsoil	• To promote visual	• NEMA.	• Final shaping will be implemented, such that, the final profile of the rehabilitated mining areas is formed to emulate natural contours of the area.	• Improved visual appearance	• Inspection Report.	• EM.	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
replacement and landscaping) will remove the visual incongruity. An overall visual improvement will be noticed once all mining related infrastructure has been demolished and the area has been landscaped and revegetated. In general, the removal	aesthetics.		• All infrastructures will be removed, and the area rehabilitated. Foundations will be removed to a depth of 1m below the surface. • All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site or made available to the local community as building materials (provided they are in a satisfactory condition following demolition). • Linear infrastructure constructed by the mine (i.e., road) will be removed if it proves to inhibit land use at decommissioning. • All fences erected around the mine will be dismantled and either disposed of at a permitted disposal site.			

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
of infrastructure is seen as a positive impact to the environment.							
• Traffic to and from the mine during the decommissioning and rehabilitation phase will cause noise disturbance until the area is cleared.	• To reduce noise induced by traffic.	• Noise Regulations • NEMA.	• Speed control measures to be implemented and enforced; road surface to be maintained weekly .	• No noise	• Complaints register.	• EM.	• During rehabilitation.
• Possibility of the loss of employment opportunities for current	• To prevent loss of employment.	• Basic Conditions of Employment Act.	• The mine will plan for closure in terms of the closure objectives as they are set out in the Social and Labour Plan requirements for the Vametco Mine Complex. The mine will continue with	• No loss of employment opportunities	• Inspection Report. • HR Records.	• EM.	• During rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
employees after the mine has close.		• Unemployment Insurance Fund.	the skills development programme to empower the workforce to undertake other activities after the closure of the mine, at other operations.				
• Fugitive dust emissions from the rehabilitation activities will negatively affect the air quality.	• To prevent dust generation.	• Dust Regulations • NEMA.	• A dust management programme must be continuously implemented. Dust suppression techniques will be implemented.	• No visible dust from site activities. • Complaints from landowners.	• Complaints register. • Inspection Report.	• EM.	• During rehabilitation.
• Loss of agricultural land capability.	• To prevent loss of agricultural land.	• CARA	• The footprint should be ripped at 25 cm to alleviate compaction as part of rehabilitation. • Stored topsoil should be replaced (if any) and the footprint graded to a smooth surface. • The landscape should be backfilled and re-profiled to mimic the natural topography for potential agricultural activities and grazing opportunities post mining. If possible, ensure a	• No loss in soil fertility.	• Inspection Report. • Soil analysis.	• EM.	• Rehabilitation.

Possible Impact	Objective	Applicable Legislation/Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
			continuation of the pre-mining surface drainage pattern. • The soil layers should be put back in the reverse order of stripping (e.g., subsoil fist then followed by topsoil). • It is recommended that soil quality assessments (through laboratory analysis) be conducted prior to establishing vegetation on the rehabilitated. • The analytical data should be evaluated by a suitably qualified expert, and soil fertility or soil acidity problems should be corrected prior to vegetation establishment. • Slopes of the backfilled surfaces should change gradually since abrupt changes in slope gradient increase the susceptibility for erosion initiation.			

8.4.3 Closure and Residual Impact Phase

The following Management Measures and Action Plans relates to activities associated with the Closure and Residual Impacts remaining after closure. The main environmental closure objectives, in addition to the objectives presented can be summarized as follows:

- Mitigation of all environmental impacts and addressing all environmental aspects based on the EMPr.
- To ensure an effective surface runoff control system to deal with the separation of clean and dirty water.
- Rehabilitate areas as soon as possible.
- The sustainable and safe rehabilitation of all activities, to address all environmental impacts as far as practical according to the EMPr.
- The sustainable rehabilitation of all activities and the mining area as a whole to ensure a sustainable endues for most of the activity sites/areas.
- Return of land to its pre-mining state where possible (i.e., agriculture/grazing for most of the mine's lease area).
- Make all areas safe for both humans and animals.
- Ensure that all areas remaining upon closure are stable, which will prevent dust and water erosion.
- Minimise the impact on the local community.
- Minimise the impact on the surrounding economic environmental and other mining activities.
- Maintenance requirements for rehabilitated activity areas/sites need to be established and documented within the capability of the subsequent land user.
- Financial provision for post closure maintenance cost of rehabilitation activity area/sites will always be appropriate to provide for premature closure in terms of the MPRDA.
- No rehabilitation work, demolition of buildings shall take place without the approval of the Business Unit Manager in consultation with the Manager (Group Environmental Manager).

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
• Decant of acid mine drainage: With rising groundwater levels the	• To manage decant water.	• MPRDA • NEMA	• It is very difficult to mitigate against AMD, as is evidenced by the water quality concerns within and around the associated the catchment. • To manage AMD, it is important that a detailed water balance be calculated for the mine and that the expected decant points and decant qualities are	• Inspection Report. • Water monitoring report.	• EM	• Decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action	Monitoring Criteria	Responsible Agent	Monitoring Frequency
risk of decant from the mining area increase. Any seepage into the mining area will find its way towards the lowest point in the mine where it will accumulate, and the mine void area will start to fill. Decant at the topographical lowest point is likely.			determined. Water influx into the mine should also be kept to the absolute minimum possible. In this regard the fracturing of the overlying strata due to blasting should be avoided at all costs, so as to prevent increased infiltration of surface water into the mine workings. Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant. Vametco must continue with the investigations to the most effective way to possibly treat water on site if needed at the end of LoM. The level to which the water is treated depends on the use of the water after treatment but should be determined in consultation with the DWS. As a minimum, treated water should meet the standards for use for livestock watering and irrigation. Water treatment plants are however very energy intensive, raising questions about the long--term viability of treatment plants as a solution to AMD, especially given the energy crisis in South Africa and South Africa's dependence on coal as a source of electricity. The installation of a Reverse Osmosis plant should be seen as a last option. Hodgson *et al.* (WRC Report 1263/1/07; 2007)			

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
			recommend the following measures for management of mine water: The feasibility and effectiveness of employing these measures at Vametco should be investigated. 1) Select the mining method based on environmental considerations 2) Mine from deep to shallow. 3) Flood the mine workings. • Flush the mines after being flooded. • Surface water monitoring of the streams will be essential. Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure. • The drilling of boreholes into mining areas is recommended so that recovery of water in mining areas can be monitored. Intercepting decant by a downstream trench or subsurface drains is an option to investigate.				
• Deterioration in water quality to the disposal facilities and	• To avoid contamination of water due to	• NWA. • NEMWA. • MPRDA	• The same mitigation measures as mentioned during the operational phase will apply and should be maintained until such a time as seepage water out of the mine	• No deterioration in water quality.	• Water monitoring report. • Complaints register.	• EM.	• During operational and decommissioning

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
the PCDs as well as RWD.	the co-disposal facility.		dump conforms to the relevant standards for aquatic ecosystems. Rehabilitation of the mine facilities should also be undertaken in such a way as to limit infiltration of rainwater into the mine dump. The use of a clay layer under the topsoil should be investigated and implemented if feasible. • Mitigation measures should be maintained until such a time as seepage water from the magnetite dump facilities conforms to the relevant standards for aquatic ecosystems. • If a risk of impact on the surface water bodies is established, a remediation action plan should be developed to negate the potential impact.	• No complaints from landowners			phase. Implement throughout LoM.
• Upon closure of the solar	• To ensure that		• Where areas are going to be disturbed through the destruction of vegetation, for example the	• No Solar Park	• Inspection Report.	• EM	• Decommissioning.

Possible Impact	Objective	Applicable Legislation /Policy	Mitigation / Management Action		Monitoring Criteria	Responsible Agent	Monitoring Frequency
farm, rehabilitation of affected areas will take place and visual aesthetics will be improved.	negative impacts on visual receptors are mitigated		establishment of the construction camp, the vegetation occurring in the area to be disturbed must be replanted with endemic, indigenous species, especially veld-grass and trees. • A hydroseeding application is recommended in the disturbed areas as a measure of rehabilitation.				

9 MONITORING MANAGEMENT PROGRAMME

9.1 HYDROLOGICAL AND HYDROGEOLOGICAL MONITORING REQUIREMENTS

9.1.1 APPLICABLE LICENCES

Competent Authority	Authorised Activities	Licence No	Issue Date	File Number
Department of Water and Sanitation.	Section 21(a) – Taking of water from a water resource. Section 21(b) – storing of water. Section 21(c) – Impeding or diverting the flow of water in a water course. Section 21(f) – Discharging waste or water containing waste into a water resource through a pipe or canal. Section 21(g) – Discharging waste or water containing waste into a water resource. Section 21(i) – Altering the bed, banks, course, or	04/A21J/ABCFGIJ/4669	31st May 2017	27/2/2/2A921/20/1

Competent Authority	Authorised Activities	Licence No	Issue Date	File Number
	characteristics in a watercourse. Section 21(j) – Removing, discharging, or disposing of water found underground if it is necessary for the efficient continuation of an activity of for the safety of people.			

9.1.2 Reporting

Reporting on surface and groundwater quality and quantity conditions will be included in the quarterly reports for the mine. An annual report will be submitted to the relevant authorities, i.e., DWS.

The quarterly report will be an update of the database with time-series graphs, statistical analysis (average, maximum, minimum, 5, 50, and 95 percentile values as well as linear performance). Laboratory results will be analysed against the target water quality guidelines for domestic use, livestock watering and irrigation, according to the South African Water Quality Guidelines, (1996: DWAF). The strictest value between the target water quality objectives or objectives through a reserve determination will be used.

In terms of flow, all water uses, and discharges will be measured on an ongoing basis. The flows include:

- Make-up water;
- Volumes of groundwater pumped out for mine dewatering purposes;
- Volumes of water pumped from the plant as part of slimes;
- Volumes of contaminated water that is recovered and used in the plant or for dust suppression; and
- Volumes of water in terms of the internal water flow processes.

An annual detailed water quality audit report on the surface and groundwater quality will be prepared to analyse the water quality situation in detail to investigate trends and non-compliance. The report will be submitted to the relevant authorities as required

by license conditions. Should the monitoring data indicate that the groundwater conditions are adversely affected, additional studies will be undertaken if it is deemed necessary.

9.1.2.1 Data Management

Monitoring results would be entered into an electronic database as soon as results are available, and at no less than one monthly interval, allowing:

- Data presentation in tabular format;
- Time-series graphs with comparison abilities;
- Statistical analysis (minimum, maximum, average, percentile values) in tabular format;
- Graphical presentation of statistics;
- Linear trend determination;
- Performance analysis in tabular format;
- Presentation of data, statistics and performance on diagrams and maps; and
- Comparison and compliance to South African Water Quality Guidelines and any other given objectives.

As far as possible, the same monitoring points will be used from the construction phase through the operational and decommissioning phases to after mine closure to develop a long-term data record and enable trend analysis and recognition of progressive impacts with time.

9.2 HYDROLOGICAL MONITORING (SURFACE WATER)

Various perennial and non-perennial rivers characterize the Vametco area. The mine has, however adopted a no-discharge policy, which ensure that all dirty water on the mine property remain within the mining area. Due to the mines commitment on not polluting the surrounding water in the area, the mine will reuse dirty water contained within the dirty water systems (i.e., PCDs).

Table 27: Surface Water Monitoring Parameters

Constituent	Class 0 (Ideal)	Class 1 (Acceptable)	Class II (Max. Allowable)	Class III (Exceeding)
pH Value @20°C	6.0-9.0	5-6 or 9.0-9.5	4-5 or 9.5-10	<4 or >10
Conductivity mS/m@25°C	<70	70-150	>150-370	>370
Total Dissolved Solids	<450	450-1000	1000-2400	>2400
Calcium, Ca	<80	80-150	>150-300	>300
Calcium Hardness as CaCO3	N/S	N/S	N/S	N/S

Constituent	Class 0 (Ideal)	Class 1 (Acceptable)	Class II (Max. Allowable)	Class III (Exceeding)
Magnesium, Mg	<30	30-70	>70-100	>100
Magnesium Hardness as CaCO3	N/S	N/S	N/S	N/S
Total Hardness as CaCo3		100-200 (Fairly Hard)	200-300 (Hard)	>300 (Very Hard)
Sodium, Na	<100	100-200	200-400	>400
Potassium, K	<25	25-50	50-100	>100
Free and Saline Ammonia as NH4	N/S	N/S	N/S	N/S
Total Alkalinity as CaCO3	N/S	N/S	N/S	N/S
Bicarbonate, HCO3	N/S	N/S	N/S	N/S
Carbonate, CO3	N/S	N/S	N/S	N/S
Chloride, Cl	<100	100-200	>200-600	>600
Sulphate, SO4	<200	200-400	>400-600	>600
Nitrate, NO3	N/S	N/S	N/S	N/S
Nitrate as N	<6.0	6.0-10	>10-20	>20
Fluoride, F	<0.5	0.5-1	1-1.5	>1.5
Total Suspended Solids	N/S	N/S	N/S	N/S
Langier Saturation Index (pH-pHs)	N/S	N/S	N/S	N/S
Sodium Absorption Ration (SAR)	N/S	N/S	N/S	N/S
Aluminium, Al	<0.15	0.15-0.3	>0.3-0.58	>0.58
Manganese, Mn	<0.05	0.05-0.1	>0.1-1	>1
Iron, Fe	<0.01	0.01-0.2	>0.2-2	>2
Chromium, Cr	<0.01	0.01-0.1	0.1-0.5	>0.5
Phosphorus as P	N/S	N/S	N/S	N/S

9.3 HYDROGEOLOGICAL MONITORING (GROUNDWATER)

A detailed groundwater monitoring programme will be implemented. Samples will be analysed for chemical and physical constituents normally associated with mining and expected impacts at specific areas as determined during risk assessments.

Water samples will be taken around the mining area as well as at the co-disposal facilities, RWD, soil stockpile areas, and other pollution control facilities quarterly.

The monitoring program should continue with current monitoring points and should be expanded to incorporate the proposed monitoring boreholes as identified on the Monitoring Map. The monitoring program will be conducted according to the recommendations as set out in the approved license. The boreholes that have been included in the monitoring program (Table 28) are monitoring boreholes and fall within the proposed mining area.

Table 28: Groundwater Monitoring Points

Site Description	Latitude (WGS84)	Longitude (WGS84)	Monitoring frequency
VGM-2	25°35'09.20"S	27°53'09.67"E	Monthly
VGM-3	25°34'58.67"S	27°52'57.93"E	Monthly
VGM-4	25°34'53.02"S	27°52'41.42"E	Monthly
VGM-5	25°34'49.52"S	27°52'51.18"E	Monthly
VGM-6	25°34'44.44"8	27°52'57.19"E	Monthly
VGM-8	25°34'28.60"S	27°53'32.12"E	Monthly
VGM-10	25°34'40.67"S	27°52'27.43"E	Monthly
VGM-11	25°34'37.67"S	27°52'31.42"E	Monthly
VGM-12	25°34'39.64"S	27°52'19.13"E	Monthly
VGM-13	25°34'35.45"S	27°52'23.99"E	Monthly
VGM-15	25°34'28.00"S	27°52'30.88"E	Monthly
VGM-16	25°34'25.79"S	27°52'19.12"E	Monthly
VGM-20	25°34'06.27"S	27°52'18.26"E	Monthly
VGM-32	25°34'37.94"S	27°52'17.07"E	Monthly
VGM-33	25°34'36.19"S	27°52'37.48"E	Monthly
VGM-34	25°34'47.83"S	27°52'42.26"E	Monthly
VGM-7	25°34'41.59"S	27°52'45.87"E	Monthly
VGM-9	25°34'49.94"S	27°52'18.54"E	Monthly
VGM-14	25°34'31.90"S	27°52'14.40"E	Monthly
VGM-17	25°34'19.22"S	27°52'15.00"E	Monthly
VGM-18	25°34'18.64"S	27°52'24.76"E	Monthly
VGM-19	25°34'09.61"S	27°52'13.95"E	Monthly
VGM-23	25°33'47.88"S	27°52'37.88"E	Monthly

VGM-24	25°33'53.30"S	27°52'23.76"E	Monthly
VGM-27	25°34'12.42"S	27°52'22.93"E	Monthly
VGM-28	25°34'17.02"S	27°52'32.93"E	Monthly
VGM-29	25°34'22.52"S	27°52'24.67"E	Monthly
VGM-35	25°34'29.49"S	27°52'35.18"E	Monthly
VGM-36	25°34'14.66"S	27°53'15.24"E	Monthly
VGM-37	25°34'27.18"S	27°52'06.94"E	Monthly
VGM-38	25°34'10.63"S	27°52'07.35"E	Monthly
VGM-39	25°33'57.81"S	27°51'44.53"E	Monthly
VGM-40	25°33'52.72"S	27°52'08.16"E	Monthly
VGM-41	25°33'34.77"S	27°52'14.25"E	Monthly
VGM-42	25°34'50.34"S	27°51'58.30"E	Monthly
VGM-43	25°34'31.14"S	27°51'57.75"E	Monthly
VGM-844	25°34'13.72"S	27°51'59.25"E	Monthly
VGM-45	25°33'55.44"S	27°51'59.93"E	Monthly
VGM-46	25°33'35.83"S	27°52'03.65"E	Monthly
VGM-21	25°33'44.87"S	27°52'18.18"E	Monthly
VGM-22	25°33'41.11"S	27°52'30.99"E	Monthly
VGM-25	25°34'01.02"S	27°52'12.13"E	Monthly
VGM-26	25°34'14.72"S	27°52'12.54"E	Monthly
VGM-30	25°34'25.73"S	27°52'12.49"E	Monthly
VGM-31	25°34'38.89"S	27°52'12.65"E	Monthly
EUM-3	25°33'58.11"S	27°51'54.67"E	Monthly
EUM-4	25°33'46.67"S	27°51'49.58"E	Monthly
EUM-5	25°34'03.41"S	27°50'38.35"E	Monthly
EUM-6	25°33'19.16"S	27°50'58.24"E	Monthly
EUM-7	25°33'21.52"S	27°51'06.59"E	Monthly
EUM-8	25°33'14.84"S	27°52'50.60"E	Monthly
EUM-9	25°33'16.29"S	27°52'56.57"E	Monthly
EUM-10	25°33'18.02"S	27°50'58.48"E	Monthly
EUM-11	25°33'47.32"S	27°51'36.97"E	Monthly
EUM-12	25°33'21.26"S	27°51'18.52"E	Monthly

EUM-13	25°33'32.32"S	27°52'00.05"E	Monthly

9.3.1 Post-Closure Phase Monitoring

Regarding post-closure monitoring points, exact locations can be targeted towards the end of life of mine based on the following criteria:

- The monitoring points can only be installed after mining activities have been completed.

The numerical model should be updated once every three years or after significant changes in mine schedules or plans by using the measured water ingress and water levels to re-calibrate and refine the impact predictive scenario.

9.4 DUST MONITORING

9.4.1 Applicable Licences

An air quality network will be established for the mine. The dust fallout network will be based on all the potential air pollutants inherent to a mining operation and associated processing plant. The sampling methodology and analysis for the dust fall must be according to the ASTM D 1739 method.

Dispersion modelling will also be used to estimate the level of air pollution that can be expected Vametco and provide information to inform the air quality network to be established.

The proposed dust fallout network can be used to meet various objectives, such as:

- Compliance monitoring.
- Validate dispersion model results;
- Use as input for health risk assessment.
- Assist in source apportionment.
- Temporal trend analysis.
- Spatial trend analysis.
- Source quantification.
- Tracking progress made by control measures.

The prominent air pollution parameters to be measured on site include particulate matter, dust, wind speed and emissions inherent to the processing plant, mining areas, and the co-disposal facilities. A monthly report must be compiled detailing the outcomes of the dust monitoring programme. This report must be kept on the mine and available for the surrounding public and/or government agencies on request.

9.5 NOISE

The following three (3) primary variables should be considered when designing acoustic screening measures for the control of sound and/or noise:

- The source - reduction of noise at the source;
- The transmission path - reduction of noise between the source and the receiver; and
- The receiver - reduction of the noise at the receiver.

9.6 MONITORING PLAN IN TERMS OF CLIMATE CHANGE

The following monitoring must be implemented with respect to Climate Change impacts.

- Temperature and humidity levels must be monitored on-site.
- A continuous monitoring station should be installed to obtain site-specific wind data. Regular maintenance checks for wind-related damage should be performed.
- Regular monitoring of fuel and energy used on site.

9.7 MONITORING PLANS IN TERMS OF SOIL AND AGRICULTURE

A short-term fertilizer program should be based on the soil chemical status after levelling. It should consist of a pre-seeding lime and fertilizer application, an application with the seeding process as well as a maintenance application for 2 to 3 years after rehabilitation or until the area can be declared as self-sustaining by an appropriately qualified soil scientist.

9.8 MINE ENVIRONMENTAL AUDITS

A register of environmental monitoring and auditing results will be available for inspection. This will also include compliance with environmental legislation. To ensure compliance with the environmental management programme and to assess the continued appropriateness and adequacy of the environmental management programme, the Vametco commits to:

- Conduct the monitoring on an ongoing basis.
- Conduct the performance assessments of the environmental management programme every two years or as agreed by the Minister in writing.
- Compile and submit a performance assessment report to the Director: Mineral Development of the environmental management programme.
- The above will be undertaken according to the Regulations (No.26275) of the Minerals and Petroleum Resources Development Act of 2002.

The mine further undertakes to:

- Appoint a responsible person(s) in writing who will monitor all environmental aspects of the site regularly. A copy of this letter of appointment including the relevant emergency numbers will be supplied to the Director: Mineral Development of the DMRE.
- The appointed person will communicate, on a regular basis, with the local interested and affected parties identified with regards to the project and will report on the progress made with regards to the implementation of the mitigation measures. Any complaints, with regards to the mining activity, will be reported to the appointed person and be recorded in the complaint register.

Compile a report with regards to the following issues, which will be submitted to the DMRE annually:

- Quantities processed to be recorded monthly.
- Percentage of disturbed area rehabilitated (rehabilitation figures) – recorded on a three-monthly basis. A six-monthly report to be compiled.
- Water quality results.
- Water levels of identified boreholes.
- A copy of the complaint's registers.

10 ENVIRONMENTAL AWARENESS PLAN AND ENVIRONMENTAL EMERGENCY RESPONSE PLAN

Environmental Awareness Plan and Environmental Emergency Response Plan are available for use as separate document.

10.1 EMERGENCY RESPONSE PLAN

10.1.1 Defining an Environmental Response Plan

Environmental emergencies occur over the short term and require an immediate response. As part of its management tools, especially ISO 14001 and ISO 45001 compliant, a mine should have an Emergency Response Plan. If one does not exist, then then, one should be compiled and disseminated to all employees and contractors, and in the event of an emergency, the emergency response plan should be consulted.

This plan must be placed around the mine, (i.e., workshop, offices, plant, etc.) where it will be easily viewed. The plan must contain a list of procedures, evacuation routes, and a list of emergency contact numbers. The mine must test the emergency response plan to identify any areas for improvement.

If the emergency can affect surrounding communities, they should be alerted via alarm signals or contacted in person. The surrounding community will be informed, before mining taking place, of the potential dangers and emergencies that exist and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers, or telephones, must be placed around the mine. A checklist of emergency response units must be consulted, and the relevant units notified.

The checklist includes:

- Fire department.
- Police.
- Emergency health services such as ambulances, paramedic teams, poisons centres.
- Hospitals, both local and further afield, for specialist care.
- Public health authorities.
- Environmental agencies, especially those responsible for air, water, and waste issues.
- Other industrial facilities in the vicinity with emergency response facilities.
- Public works and highways departments, port, and airport authorities.
- Public information authorities and media organisations.

10.1.2 Emergency Procedures

10.1.2.1 The Event of an Injury to any person

In the event of an Injury to any person, the following procedure must be followed.

1. Takedown details from the person reporting the incident, including the following:
    - telephone number of the person reporting the incident.
    - nature of injuries to accident victim.
    - if assistance is required from the paramedic.
    - where the accident victim is located.
    - if transport is required to case vac patient.
    - instruct the person reporting the incident to leave a messenger by the phone.
2. If the injuries are serious, contact the following numbers:
    - Ambulance; or
3. Await paramedics and instruct them to proceed to the accident site.
4. Notify security and inform them of ambulance arrangements and where the said vehicle must go to.
5. Inform the paramedic called out of the following:
    - telephone number of the person reporting the incident.

- nature of injuries to accident victim or victims.
- location of injury on body (arm, leg, head, etc.).
- where the accident victim is presently.
- condition of victim (breathing, stable, etc.).

6. If necessary, provide a guide at the security gate, to escort the ambulance or paramedics to the required location.
7. Inform your manager or the next senior manager of the accident.

NOTE:

The procedure does not change because there is more than one accident victim. One or twenty victims must be handled in the same manner.

10.1.3 Emergency Procedure for Duty Officials

In the event of an explosion or fire occurring in the underground environment, the following actions and phases must be taken by the duty official:

First Phase:	Second Phase:

• The following details of the incident from the reporter must be noted.
  ○ Nature of the incident, explosion, fire etc.
  ○ Location of the incident, explosion, fire, etc.
  ○ If there are casualties and the nature and extent of their injuries.
  ○ Ask if the reportee requires assistance (rescue team, doctor, paramedic, transport etc.).
  ○ If the reportee and his team are going to or are in the rescue chamber.
  ○ The phone number of the reporter.
  ○ Name of person reporting the incident.
• Based on the above-mentioned information, the official on duty will decide whether to evacuate any or all other work areas of the mine, making use of the current escape plan for the section or area.
	• Appoint lamp room attendant as required in terms of the standard emergency procedure to conduct shaft clearance of evacuates.
	• If necessary, send for ER 24, fire brigade, police, etc.
	• Give feedback to newly appointed incident coordinator once he is present on the mine and handover the role to the new incident coordinator.
	• Follow the instructions of the Mine Manager.
	• Refer all media inquiries to the head office legal department.
	• Remain in position at control room until relieved.
	• Brief the officials on current situation.

• Report the incident to the mine manager and the Subordinate Manager.
• If the mine manager is unobtainable then report the incident to the next lowest level of official (engineer, mine overseer, etc.).
• Contact and call out the following personnel:
  ○ The mine doctor and paramedics.
  ○ Occupational hygienist (Ventilation Officer).
  ○ The mine overseer for the incident area.
  ○ The mining engineer.
  ○ The safety manager.
• Begin a logbook or record of events putting in detail of times and who said what, where and when, going back to the original reportee.	

NOTE: (i) The official will assume the position of the incident controller until relieved of that position by the newly appointed incident controller, i.e. (mine manager, engineer, etc.). (ii) It is important to ensure that all phone messages are kept to a minimum duration throughout the incident period.	***NOTE:*** Remember to always maintain a logbook throughout the duration of the incident.

10.1.4 Process for Identifying Emergency Procedures

The process of identifying emergencies situations at Vametco is conducted in terms of the Aspects Registers and may include the following emergencies:

- Magnetite dump burning.
- Discard dump, TSF, WRD failure.;
- PCDs, RWD, barren and scrubber dams overflow and breach.
- Berm Breach/Drain overflow.
- Hydrocarbon Spill (diesel, oil, grease, etc.).

- Veldt Fires.

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10.1.5 Most likely Potential Environmental Emergencies

The following define the most likely potential environmental emergencies:

- Accidents.
- Fires, spontaneous combustion on co-disposal facilities, and underground workings.
- A major hydrocarbon spill or leak.
- A major spill or leak of process water.
- Flooding.
- Explosions.
- Waste disposal facilities failure.

10.1.5.1 Accidents

In the case of a medical accident or problem, the mine should have at least a first aid kit available, and a First Aid officer should be always on duty. It is preferential that the mine has a First Aid room or a small clinic. In the event of an emergency a contact directory of emergency response units must be consulted, and the relevant units notified. In this case, many of the emergency services will be sourced from the nearest main town, Brits.

10.1.5.2 Fire

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire extinguishers should be placed around the mine.

The procedure to be followed involves the following:

- In the event of a fire, an alarm should be activated to alert all employees and contractors.
- Identify the type of fire and the appropriate extinguishing material. For example, water for a grass fire and mono ammonium phosphate-based fire extinguishers for chemical and electrical fires.
- In the event of a minor fire, fire extinguishers placed around the mine must be used to contain and extinguish the fire.
- In the event of spontaneous combustion, the area should be covered with unweathered material.
- In the event of a major fire, the local area council's fire department will be notified and should react timeously.
- All staff will receive training in response to a fire emergency on-site.
- A Fire Association must be set up with the mine and surrounding landowners to facilitate communication during fire events and assist in fighting fires, where necessary.
- In case of a chemical or petroleum fire, run-off from the area should be contained as far as possible using the most appropriate measures e.g., spill absorbent cushions, sand, or a physical barrier.

10.1.5.3 Major Hydrocarbon Spill:

Hydrocarbons such as diesel, petrol, and oil will be kept on site as fuel for the mine machinery. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

Diesel, engine oil and hydraulic oil are the most likely hydrocarbons identified during impact assessments that can result in an emergency. The following procedure applies to a major hydrocarbon spill:

- In the event of a minor spillage, the soil should be treated in situ using Hazmat clean-up kits.
- Every precaution must be taken to prevent the spill from entering the surface water environment.
- In the event of a large spillage, adequate emergency equipment for spill containment or collection, such as additional supplies of booms and absorbent materials, will be available. If required, a specialised clean-up crew will be called in to decontaminate the area. The soil should be removed and treated at a soil rehabilitation facility/site.
- Reasonable measures must be taken to stop the spread of hydrocarbons and secure the area to limit access.
- Dispatch necessary services.
- The incident must be reported to the Environmental Manager immediately.
- The Environmental Manager will assess the situation from the information provided and set up investigation team or relevant personnel. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident.
- When investigating the incident, priority must be given to safety.
- Once the situation has been assessed, the Environmental Manager must report back to the Mine Manager.
- The Mine Manager and the investigation team must decide on what measures can be taken to limit the damage caused by the incident, and if possible, any remediation measures that can be taken.
- The Environmental Officer or person in charge should have a list of company contact details that will facilitate with the clean-up operations.

10.1.5.4 Major Water Leak or Spill:

Dams wall failures and burst high-volume dirty water pipelines have been identified as potential emergency situations. The following steps should be followed:

- Turn off all water supply to the dam/pipeline.
- Dispatch necessary emergency services.
- Take all reasonable measures to stop the spread of contaminated water.
- The incident must be reported to the Environmental Manager immediately.

- The Environmental Manager will assess the situation from the information provided and set up investigation team or relevant personnel. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident.
- When investigating the incident, priority must be given to safety.
- Once the situation has been assessed, the Environmental Officer must report back to the Mine Manager.
- The Mine Manager and the investigating team must take a decision on what measures can be taken to limit the damage caused by the incident, and if possible, any remediation measures that can be taken.

10.1.5.5 Flooding:

There is potential for flooding during the rainy season, but particularly November to January when severe thunderstorms can occur. This could result in a large volume of water flowing downstream or accumulating in a water containment facility and could cause major damage to equipment and endanger the lives of employees on site. Procedures must be put in place to ensure that there is a quick response to flood events and damage is kept to a minimum. The procedure for flooding includes:

- DWS flood warning system should be reviewed annually.
- The use of emergency pumps should occur if the water floods the box cuts, where it may be exposed to contamination.
- Mine management should be made aware of any such event so they can take appropriate action to ensure production losses are kept to a minimum.
- All dams and water containment facilities should have a 0.8m free bord and an overflow or outlet to ensure that no damage occurs to the facilities.
- All contaminated water should be contained on site, as far as possible and discharges to the environment should only occur, if necessary, in an extreme flood event.

10.1.5.6 Explosions:

Explosions can occur with the presence of methane gas, or they can occur in the plant and workshop areas when working with gas cylinders and chemicals. These could result in large numbers of employees being injured and requiring medical assistance. The procedure for explosions includes:

- A Proto Team should be ready and deployed for assisting with the evacuation of employees working in the mine.
- Alternative evacuation routes should be devised, should a rock fall occur as a result of the explosion.
- Alternative air supply routes should be identified and implemented.
- All relevant emergency response units must be notified, and hospitals informed of incoming patients.

10.1.5.7 Dump Failure:

The dump could fail as a result of too much water being stored on it resulting in the slumping and collapse of a side. The procedure for dump failure includes:

- Rescue, evacuation, and medical assistance, where necessary, to any persons affected by the incident.
- Efforts will be directed to the containment and neutralisation of the influx and prevention of further injury.
- It is essential to assess the extent of damage/pollution as soon as possible after the event.

This will best be accomplished by:

- Communication
- Site Controller.
- Media Controller.
- Media Consultant.
- Green Groups.
- Incident Controller.
- Political Representatives.
- Chief Inspector of Mines.
- Department of Environmental Affairs.
- Department of Human Settlements, Water and Sanitation.
- Transitional Local Council.
- Any other relevant or statutory authority.

10.1.6 Reporting

The responsible person will as soon as possible verbally report the occurrence to the Mine Manager and the Environmental Management Representative. A detailed non-conformance report will be written by the responsible person and handed in to the Environmental Department for investigation.

Environmental Incidents which may cause pollution of water resources will be reported to the Department Human Settlement Water (DHSWS) and Sanitation in accordance with the requirements of the National Water Act, 1998 (Act No. 36 of 1998). If necessary, the Department of Mineral Resources and Energy and/or the Department of Environment, Fisheries and Forestry will be notified of the occurrence by the Environmental Management Representative.

10.1.7 Emergency Response Testing

Emergency response testing will be undertaken annually, and it is the responsibility of the Environmental Management Representative to determine what tests should be conducted on mentioned potential emergency situations. Consideration to the practicalities involved will be taken and efforts should be undertaken to affect minimum disruption to the operations. As such it is preferable to conduct mock tests. Once a Mock test has been done, a meeting will be held between interested parties to validate if planned arrangements were effective, and responses were adequate.

10.1.8 Records

Records derived from the implementation of this procedure will be controlled in accordance with the requirements as defined in Procedure SOP 02, available in the Environmental Management System documents.

10.1.9 Emergency Incident Reporting

Environmental incident reporting is a vital part of communication at Vametco. Employees are required to report all environmentally related problems, incidents, and pollution, so that the appropriate mitigatory action can be implemented timeously. In the event of an Environmental Incident, the reporting procedure as indicated in Table 29 should be followed:

Table 29: Environmental Incidence reporting procedures

Environmental Incident Reporting Structure	Actions Required
Person causing or observing the incident	• Shall report the incident to an immediate supervisor in the area/section where the environmental incident is observed.
Line Management in relevant area of responsibility where the incident occurred	• Shall investigate the incident and record the following information: • How the incident happened. • The reasons the incident happened. • How rehabilitation or clean up needs to take place. • The nature of the impact that occurred. • The type of work, process or equipment involved. • Recommendations to avoid future such incidents and/or occurrences. • Shall inform the Environmental Manager and the Mine Manager daily of all incidents that were reported in the area/section. • Shall consult with the relevant department / person for recommendations on actions to be taken or implemented where appropriate (e.g., clean-ups). • Shall assist the Environmental Manager and/or Mine Manager with applicable data to accurately capture the incident into the reporting database.
Area / Line Managers	• Shall forward a copy of the incident form to other line managers. • Shall forward a copy of the incident form to the Environmental Manager. • Shall inform the relevant department / person on a weekly basis of the incident by e-mail or by submitting a copy of the incident report. Once a High-Risk Incident (any incident which results from a significant aspect and has the potential to cause a significant impact on the environment) occurred it must be reported immediately to the Environmental Manager and the Mine Manager by telephone or email to ensure immediate response / action.

Environmental Incident Reporting Structure	Actions Required
	• Shall forward a copy of the completed Incident Reporting Form (and where applicable a copy of the incident investigation) to the relevant department / person.
Environmental Manager / Line Manager	• Shall complete an incident assessment form to assess what level of incident occurred. • Shall make recommendations for clean-up and / or appropriate alternate actions. • Shall enter actions necessary to remediate environmental impacts into the database in conjunction with the responsible line manager. • Shall enter the incident onto the database to monitor the root causes of incidents. • Shall include the reported incidents in an appropriate monthly / quarterly report. • Shall highlight all incidents for discussion at HSEC meetings.

10.2 ENVIRONMENTAL AWARENESS PLAN

10.2.1 Communication Sectors

The communication of the environmental risks for each phase of the project will take place for the management, administrative and mine worker sectors of the mine, as well as contractors.

10.2.2 Management Sector

A workshop will be conducted to inform all mine management of the risks associated with the mining operation. The risks for all aspects will be explained and the appropriate management options discussed. The workshop will also elaborate on the monitoring programmes that will be implemented to identify and monitor the mines level of impact on the environment and discuss various remediation actions, should there be a deterioration. The evaluation process is integral in the assurance that the mine reduces ay possible environmental risks associated with the operation.

The workshop will be conducted prior to the construction phase to ensure that all risks are discussed before there is any chance of the impacts occurring. The workshop may be repeated at certain stages during the life of the project, in the case of new employees.

10.2.3 Administrative Sector

The communication of the environmental risks to the administrative sector will occur through a workshop / half day course. This workshop will seek to explain the following necessary actions:

- Firstly, each aspect will be described as shown in Table 25; Table 26 and Table 27. Risks associated with each aspect will be discussed to ensure that there is an understanding of how each action of the project may impact on the environment.
- The mitigation of the environmental risk will be elaborated on. It is important that each person understand these management strategies as it ensures that the impact on the environment is kept to a minimum. Data collection regarding each aspect will also be explained to ensure that each aspect is monitored according to those protocols specified by the mine and the DMRE. Along with data collection the reporting of findings will be discussed.
- This workshop will take place before the construction phase begins, thus ensuring a full understanding of the project and its associated environmental risks before any construction activity is undertaken. The course will be repeated at the beginning of the operational phase and the material will be integrated in the induction for new personnel.
- The following communication channels and media will/can be used to communicate environmental issues within Vametco:
    - **HOD Meetings**: The Mine Manager communicates information to senior management on environmental issues and the information is minutes recorded.

- **HSEC Meetings**: 'Environmental issues' should be an agenda item on the plant and section monthly safety, health & environmental meeting agendas.
- **Publications**: Leaflets, posters etc. are produced by the relevant department or other designated persons, for use on notice boards, and distribution. Quarterly newsletter will also be made available. Email notifications and or relevant articles are also distributed.
- **EMS Database** (if established): Feedback from line management on objectives, targets, and actions.
- **Daily/ Weekly Safety Meeting**: All meetings are scheduled to commence with a discussion on safety, health & environmental topics.

10.2.4 Mine Workers Sector

The mine workers associated with the construction activities will attend a half day induction course to ensure that each person is aware of the environmental risks associated with the project. This induction will form part of the health and safety induction. This induction course will explain and describe the relevant phases of the project as well as those environmental risks that may occur during these phases. The environmental risks of each aspect as well as the mitigation will be elaborated on.

10.2.5 Contractors

An environmental awareness section will be added to the contractor's health and safety induction programme. The environmental induction will focus on activities that carry an environmental risk, actions to be taken to reduce these risks, and procedures to be followed in the event of an incident.

10.3 METHODS OF COMMUNICATION

10.3.1 Induction

All full-time staff and contractors are required to attend an induction session. Employees are inducted when they start at the mine and when they return from leave. Any contractor, who works on the mine for a period of 24 hours or more, is required to undergo the respective Head of Department (HOD) induction training. These workshops will be conducted in English, as well as one of the local languages. This induction will form part of the health and safety induction.

Environmental issues and aspects related to the operation phase and other relevant phases will be addressed in the induction sessions. All environmental impacts and aspects and their mitigatory measures will be discussed, explained and communicated to employees. The induction sessions will be modified according to the level of employee attending the induction session, so that all employees gain a suitable understanding of environmental issues and pollution.

10.3.2 Environmental Symposiums

Environmental symposiums can be held with management, and selected groups of supervisors/foremen and/or employee representatives. This will take the form of an open discussion between the relevant department and these individuals. The symposiums will aid in environmental awareness being generated at all levels, as well as to assist the relevant department in defining all and identifying new environmental issues, concerns, and pollution sources.

10.3.3 In-house Training

In-house training sessions will be held with relevant employees. The training sessions will be determined by the relevant department and will allow for employees to participate in determining what the environmental issues and concerns are regarding their specific occupation. Education regarding environmental incident reporting will be detailed at these sessions.

10.3.4 On the Job Training

On the job training is an essential tool in environmental awareness. Employees will be given details of the expected environmental issues and concerns specifically related to their occupation. Employees will be trained on how to respond if an environmental problem or source of environmental pollution arises. The training will be on-going, and all new employees will be provided with the same standard of training as existing employees.

10.3.5 General Training and Skills Development

Human Resources Development Programmes will include appropriate training and skills development programmes as required by the workforce in support of operation specific business plans (both mining and non-mining related). Training will be offered in portable skills, being competencies that will enable employees to find jobs elsewhere within the mining industry, or to become self-employed. Basic environmental and pollution control skill will be included in this training.

10.3.6 Environmental Open Days

Environmental open days will be arranged for at least once a year by Vametco's environmental/management and liaison departments. Open days will be utilised to discuss environmental issues in a less formal manner, thereby allowing employees the opportunity to participate in environmental management by educating them about environmental pollution and waste management in areas beside the workplace (e.g., at home). The open days will not be confined to employees only, but to identify interested and affected parties including surrounding landowners and all stakeholders, to ensure that the principles of environmental management, pollution prevention, waste management and sustainable development are communicated to the communities surrounding the operation.

10.3.7 Environmental Talk Topics

Monthly environmental talk topics must be undertaken by the Environmental Officer with the different working teams to raise awareness on environmental, health and safety issues. A register of attendees at these sessions must be kept in the environmental file.

10.3.8 Other

Other ways of engagements which can help in increasing the awareness of the community regarding environmental constraints and opportunities shall be implemented where necessary. At corporate level, this includes providing support for NGOs involved with specific environmental awareness programmes.

10.4 ENVIRONMENTAL COMMUNICATION STRATEGIES AT VAMETCO

Vametco management shall continue to establish and maintain procedures for the internal communication between the various levels and functions of the organisation, and receiving, documenting, and responding to relevant communication from external interested & affected parties. The communication of the environmental risks for each phase of the project will take place for the management, administrative and mine worker sectors of the mine, as well as contractors. The organisation shall consider processes for external communication on its significant environmental aspects and record its decision.

Communication is a management responsibility. All supervisors are responsible for effective communication within their own sections. Environmental communication can be divided into two categories: internal communication and external communication.

10.4.1 External Communication

External communication is done within the Administrative Sector. Please refer to Section 10.5 for details pertaining to internal communication within the administrative sector.

10.5 External Communication Strategies

The following communication channels and media will/can be used to communicate environmental issues to individuals who are not employed by :

Table 30: Vametco West Communication Strategy

Communication Mode	Communication Strategy	Responsible Parties	Period/Frequency
Environmental Committee	An Environmental Committee should be established and used as a forum to keep interested and affected parties informed of the significant environmental aspects identified through the Environmental Impact Assessments and Management Plans. This should also be the forum were interested and affected parties get the opportunity to raise environmental concerns. Records must be kept of all decisions and concerns for a minimum of 10 years. The Environmental Committee should be chaired by the Mine Manager, or another appropriately appointed competent individual.	Mine Manager	10 years
Publications	Selected publications should be produced and used to communicate environmental issues to outside parties. Examples include newsletters and Annual Reports.	Vametco Communications	As and when required
Communication from External Parties and Employees	Clear communication point should be established within the company that will be responsible for liaison with the media in respect of any crisis that may arise within Vametco. A complete procedure for media liaison must be made available to all employees. Communication from external interested and affected parties may be received by e-mail, fax, telephonically or by mail. Where required, a written response will be sent, on receiving such communication, by the appropriately appointed individual under signature of the Mine Manager, to the respective interested and/or affected party. All telephonic or facsimile correspondence received on the mine must be forwarded to	Vametco Communications	As and when required

Communication Mode	Communication Strategy	Responsible Parties	Period/Frequency
	the relevant department for action. All events or concerns will be captured and actioned on an existing and/or future database.		
E-mail	Email communication received must be stored, with replies, in an appropriate folder on a server. E-mail messages, relevant to environmental management, should be kept for a minimum of two years before deletion.	All employees	2 years
Mail	Correspondence received by mail must be filed, along with the response (where relevant), within the relevant department's filing system for a minimum period of two (2) years. Paper correspondence will be archived in the Environmental department.	Communications	2 years
Telephone	A register of telephonic environmental queries should be kept by the relevant department detailing caller, contact details, date, query, action taken and response. Furthermore, the person answering the call will be responsible for logging their particulars against the call, as well as ensuring that all communication that leads to an aspect or an impact, is entered on the database.	Communications	2 years
Storage of Correspondence	All original correspondence must be retained by the Vametco Mine Manager for a minimum period of two years.	Mine Manager	2 years
Environmental Reports:	Copies of relevant Specialist Study Reports and Environmental Impact Assessments will be made available on request from an external party for a period of 3 years.	Consultant Environmental Manager	3 years

Communication Mode	Communication Strategy	Responsible Parties	Period/Frequency
Queries and Requests from the Media	Requests for articles from the media on environmental issues at Vametco will be co-ordinated by the HR Manager, with input from the relevant department, as approved by the General Manager, in line with the Vametco Communication Strategy. The Vametco Communication Strategy is based on a behavioural approach. Due to the environmental awareness generated by induction, on the job training etc., employees can identify environmental problems, issues, concerns, and pollution timeously.	Vametco Communications	As and when required
Queries from Interested and Affected Parties	Response to queries about environmental impacts and aspects will be addressed by the relevant department and approved by the Mine Manager.	Environmental Manager	As and when required

Table 31: Environmental Awareness Plan for the Construction Phase at Vametco

Environmental Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
Soil	Increase in soil erosion	Workshop	Induction	Induction	Induction	Rehabilitate area as soon as possible; and stockpile soil in the correct manner
	Contamination of Soil	Workshop	Induction	Induction	Induction	• All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored. • Spill kits should be readily available, and all employees must be trained in the utilisation

						thereof; Should a spill take place the area should be cleaned immediately, and the contaminated area will be rehabilitated as appropriate. • Prevent spillages by the implementation of good housekeeping practices. • The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme. • In the event of a major spill that could result in major soil and water contamination the DWS should be informed immediately and a remediation strategy should be enforced; • The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme; and No activities associated with hydrocarbons and or chemicals (i.e., wash bays etc.) may be undertaken

						outside of an effectively designed contained area
Fauna	Disturbance of fauna	Workshop	Induction	Induction	Induction	Workers must be educated on animal species; report any rare or endangered species; and Hunting and trapping of fauna will be strictly prohibited.
Flora	Damage to flora	Workshop	Induction	Induction	Induction	Limit the area of disturbance to the footprint area of the affected sites only.
Surface Water	Surface Water Consumption	Workshop	Induction	Induction	Induction	Limit water use and recycle where possible; and See above for the correct handling and storage of hydrocarbons.
Groundwater	Groundwater Contamination	Workshop	Induction	Induction	Induction	Limit water use and recycle where possible; and See above for the correct handling and storage of hydrocarbons.
Air quality	Generation of Dust	Workshop	Induction	Induction	Induction	Dust Suppression methods will be implemented.
	Generation of Smoke	Workshop	Induction	Induction	Induction	Open fires will be prohibited on the property.
Heritage	Destruction of Graves and archaeological sites	Workshop	Induction	Induction	Induction	All graves located on site must be relocated to the proper graveyard through consultation with the suitably qualified heritage specialist. i.e., bone,

Table 32: Environmental Awareness Plan for the Operational Phase at Vametco

Environmental Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
Soil	Increase in Soil erosion	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	Rehabilitate area as soon as possible; and stockpile soil in the correct manner and vegetate.
	Contamination of Soil	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	• All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored; • Spill kits should be readily available and all employees must be trained in the utilisation thereof; • Should a spill take place the area should be cleaned immediately and the contaminated area will be rehabilitated as appropriate. • Prevent spillages by the implementation of good housekeeping practices; • The management of chemicals and hydrocarbons should form part of the

						emergency preparedness and response programme; • In the event of a major spill that could result in major soil and water contamination the DWS should be informed immediately and a remediation strategy should be enforced; • The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme; and • No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area
	Loss of Soil Structure Fertility	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	Topsoil will be stripped to at least 250mm or until hard rock is reached; stockpile soils separately from rocks and or spoil material; Erosion control measures will be implemented; and the mine will ensure that equipment movement over the stockpiles is limited to reduce soil compaction, soil structure or the associated sandbank.

Surface water	Surface Water Contamination	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	See above for the correct handling and storage of hydrocarbons; and all contaminated water to be stored – zero discharge policy.
Groundwater	Groundwater Contamination	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	Water ingress into the underground mining sections will be prevented to limit acid mine drainage; and Precautions will be implemented to prevent acid mine drainage.
Air Quality	Generation of Dust	Workshop	Induction	Induction & Monthly Meeting	Induction & Monthly Meeting	Dust suppression methods will be implemented

Table 33: Environmental Awareness Plan for the Decommissioning Phase at Vametco

Environmental Parameter	Risk	Communication Strategy				Mitigation Activity
		Management	Administration	Mine Workers	Contractors	
Soil	Incorrect rehabilitation	Workshop	Workshop	Induction	Induction	The correct placement of soil layers will be implemented.
	Lack of soil fertility	Workshop	Workshop	Induction	Induction	Fertilization programmes will be introduced.
Flora	Alien invader species	Workshop	Workshop	Induction	Induction	Indigenous vegetation establishment will be encouraged; and A weed control programme will be implemented.

Surface water	Water quality deterioration	Workshop	Workshop	Induction	Induction	Detailed water monitoring programme to be implemented.
Groundwater	Groundwater contamination	Workshop	Workshop	Induction	Induction	Detailed water monitoring programme to be implemented.
Air Quality	Generation of dust	Workshop	Workshop	Induction	Induction	Dust suppression methods will be implemented.

10.5.1 Evaluation of the Environmental Awareness Plan

The evaluation of the environmental awareness plan will be conducted by the management of the Mine. This evaluation will entail the auditing of the operation in both the construction and operation phase once activity has commenced.

11 GENERIC CONDITIONS

To ensure compliance with Vametco's environmental policy as well as environmental legislation requirements, the following generic conditions are applicable:

11.1 SITE DOCUMENTATION / MONITORING

The standard Vametco site documentation must be used to keep records on site. All documents must be kept on site and be available for monitoring and auditing purposes. The documentation must be signed by all parties to ensure that such documents are legitimate. Regular monitoring of all sites work by the ECO is imperative to ensure that all problems encountered are solved punctually and amicably. When the ECO is not available, the Environmental officer, construction manager or supervisor shall keep abreast of all works to ensure no problems arise.

Monthly reports shall be forwarded to Vametco with all information relating to environmental matters. The following Key Performance Indicators must be reported on a bi-weekly (every two weeks) basis:

- Complaints received from landowners and actions taken.
- Environmental incidents, such as oil spills, concrete spills, etc. and actions taken.
- Incidents possibly leading to litigation and legal contraventions.
- Environmental damage that needs rehabilitation measures to be taken.

The following documentation shall be kept on site:

- Access negotiations and physical access plan.
- Signed Landowner agreements were applicable.
- Complaints register.
- Site daily dairy.
- Records of all remediation / rehabilitation activities.
- Copies of monthly ECO reports.
- Copy of the EMPr.
- Copy of the EA.

- Copies of all licences and permits.

11.2 FAILURE TO COMPLY WITH THE ENVIRONMENTAL CONSIDERATIONS

The ECO and Vametco will, acting reasonably, have the authority to instruct the Contractor to suspend part or all the construction activity if such activity causes or may causes unacceptable damage to the environment by not adhering to the specifications. The suspension will be enforced until such time as the offending parties' actions, procedures and/or equipment are corrected, and adequate mitigation measures implemented.

12 FINALISATION OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr is dynamic document, which must be updated as and when required. It is considered critical that this EMPr be updated to include site-specific information and specifications following the final-walk-through survey of the development site.

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