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# ENVIRONMENTAL IMPACT ASSESSMENT REPORT & ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR:

The Environmental Impact Assessment for the proposed Mining Right combined with a Waste Licence application to mine for Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody near Mooinooi on Portion 2, Portion 155 & Portion 156 of the farm Elandskraal 469, Registration Division: JQ, North West province.

<b>NAME OF APPLICANT:</b>	<b>Bila Civil Contractors (Pty) Ltd</b>
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<b>REFERENCE NUMBER:</b>	<b>NW30/5/1/2/2/10208MR</b>

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### **PROJECT INFORMATION**

**Project Name:** The Environmental Impact Assessment for the proposed Mining Right combined with a Waste Licence application to mine for Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody near Mooinooi on Portion 2, Portion 155 & Portion 156 of the farm Elandskraal 469, Registration Division: JQ, North West province.

**DMRE ref:** NW30/5/1/2/2/10208MR

**Report Title:** EIR & EMP


**Prepared By:** Milnex CC

**Date:** 06 July 2022

### **QUALITY CONTROL:**

**Report Author:** Lizanne Esterhuizen  
**Report Reviewer:**

**Name:** Honours Degree in Environmental Science  
**EAPASA reg: 2021/4429**

**Signature:** 

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### **The DFFE screening tool was used in compiling this document**

The Public Participation Process (PPP) must follow Regulation 41 of NEMA EIA Regulations; thus, the process needs to be transparent. However, due to the Protection of Personal Information Act (POPI Act) which commenced on 01 July 2021, Stakeholders, Landowners, surrounding landowners and registered I&AP' addresses, contact details and comments will not be included in any draft report to be circulated. All this information will form part of the final report to be submitted to the Competent Authority only.

Should you be identified as a Stakeholder, Landowner, Surrounding landowner and you do not wish to receive any further communicate from Milnex CC regarding the application in question, you may request in writing that your details be removed from the Milnex CC database for this application.

### IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

**It is therefore an instruction that** the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

**It is furthermore an instruction that** the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

## ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

- (1) The environmental impact assessment process must be undertaken in line with the approved plan of study for environmental impact assessment.
- (2) The environmental impacts, mitigation and closure outcomes as well as the residual risks of the proposed activity must be set out in the environmental impact assessment report.

## OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

2. The objective of the environmental impact assessment process is to, through a consultative process-
  - (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
  - (b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
  - (c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
  - (d) determine the--
    - (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    - (ii) degree to which these impacts-
      - (aa) can be reversed;
      - (bb) may cause irreplaceable loss of resources, and
      - (cc) can be avoided, managed or mitigated;
  - (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
  - (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
  - (g) identify suitable measures to avoid, manage or mitigate identified impacts; and
  - (h) identify residual risks that need to be managed and monitored.



**SCOPE OF ASSESSMENT AND CONTENT OF ENVIRONMENTAL IMPACT ASSESSMENT REPORTS**

**A. CONTACT PERSON AND CORRESPONDENCE ADDRESS**

**a) Details of:**

- i) The EAP who prepared the report**
- ii) Expertise of the EAP**

Details of The EAP who prepared the report & Expertise of the EAP

Milnex CC	Qualifications	Contact details
Lizanne Esterhuizen	Honours Degree in Environmental Science & Registered EAP (EAPASA), Reg No: 2021/4429 (refer to <b>Appendix 1</b> )	Tel No.: (018) 011 1925 Fax No.: (053) 963 2009 e-mail address: <a href="mailto:lizanne@milnex-sa.co.za">lizanne@milnex-sa.co.za</a>

**Summary of the EAP’s past experience.** (Attach the EAP’s curriculum vitae as **Appendix 2**)

Milnex CC was contracted by **Bila Civil Contractors (Pty) Ltd** as the independent environmental consultant to undertake the Scoping and EIA process for the proposed Mining Right combined with a Waste Licence application to mine for Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody near Mooinooi on Portion 2, Portion 155 & Portion 156 of the farm Elandskraal 469, Registration Division: JQ, North West province.

Milnex CC does not have any interest in secondary developments that may arise out of the authorisation of the proposed project.

Milnex CC is a specialist environmental consultancy with extensive experience in the mining industry which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Milnex CC benefits from the pooled resources, diverse skills and experience in the environmental and mining field held by its team that has been actively involved in undertaking environmental studies for a wide variety of mining related projects throughout South Africa. The Milnex CC team has considerable experience in environmental impact assessment and environmental management, especially in the mining industry.

Milnex CC have experience consulting in the environmental field. Their key focus is on environmental assessment, advice and management and ensuring compliance to legislation and guidelines. They are currently involved in undertaking EIAs for several projects across the country (refer to **Appendix 2** for CV).

## B. DESCRIPTION OF THE PROPERTY

**Table 1:** description of the property

	FARM NAME	REGISTRATION DIVISION
<b>Application area</b>	1) Portion 2 of the farm Elandskraal 469 2) Portion 155 of the farm Elandskraal 469 3) Portion 156 of the farm Elandskraal 469	JQ
<b>Extent of the area required for mining</b>	304,8259 Hectares	
<b>Extent of the area required for infrastructure, roads, servitudes etc</b>	50 Hectares	
<b>Depth of the mineral below surface</b>	The mineralization forms an outcrop in the southern area of the license are and dips towards the north.	
<b>Distance and direction from nearest town</b>	The farm Elandskraal 469JQ is located 8.5 Kilometers Northeast of Mooinooi, North West Province	
<b>21 digit Surveyor General Code for each farm portion</b>	1) T0TJQ0000000046900002 2) T0TJQ0000000046900155 3) T0TJQ0000000046900156	
<b>Minerals applied for</b>	<ul style="list-style-type: none"> <li>• Chrome Ore,</li> <li>• Phosphate Ore,</li> <li>• Manganese Ore,</li> <li>• Nickel Ore,</li> <li>• Platinum Group Minerals (PGM),</li> <li>• Vanadium Ore</li> <li>• Stone Aggregate (From Waste Dumps) (STW)</li> <li>• and associated minerals within the orebody</li> </ul>	

iii. Farm co-ordinates

Table 2: Farm co-ordinates

FARMS		LONGITUDE	LATITUDE
1) Portion 2 of the farm Elandsdraal 469 2) Portion 155 of the farm Elandsdraal 469 3) Portion 156 of the farm Elandsdraal 469	0	27° 35' 59,215" E	25° 42' 56,537" S
	1	27° 34' 54,808" E	25° 43' 3,679" S
	2	27° 34' 55,115" E	25° 43' 9,117" S
	3	27° 34' 42,653" E	25° 43' 20,054" S
	4	27° 34' 55,375" E	25° 43' 22,172" S
	5	27° 35' 12,861" E	25° 44' 23,688" S
	6	27° 35' 27,329" E	25° 44' 42,916" S
	7	27° 35' 48,154" E	25° 44' 37,977" S
	8	27° 35' 50,355" E	25° 44' 30,233" S
	9	27° 35' 31,440" E	25° 44' 31,265" S
	10	27° 35' 27,052" E	25° 43' 25,416" S
	11	27° 35' 42,521" E	25° 43' 24,697" S
	12	27° 35' 42,923" E	25° 43' 29,016" S
	13	27° 35' 45,013" E	25° 43' 28,724" S
	14	27° 35' 47,434" E	25° 43' 24,766" S
15	27° 35' 56,684" E	25° 43' 23,167" S	

C. LOCALITY MAP

(show nearest town, scale not smaller than 1:250000 attached as Appendix 3).

A Locality map is attached in Appendix 3 and on figure 1 below.

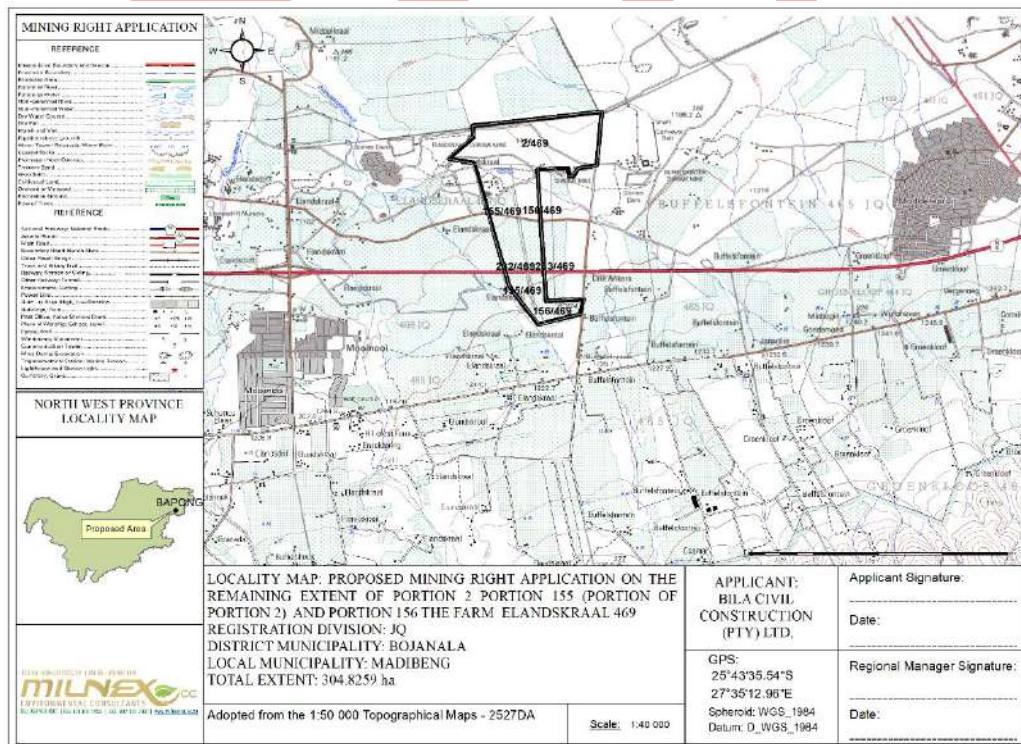


Figure 1: Locality Map





Figure 4: Mineral resource map (Appendix 4)

According to the information received from the Bila Civil Contractors (Pty) Ltd the location of the proposed opencast mining area is illustrated in white in the map above.

Figure 4 also shows Samancor Mooinooi on the left of the proposed mining right application area and TCS Mining and Samancor Smelter on the right side. The Blast Impact Assessment study identified all possible structures in a possible influence area. This list (Table 6) is available in the specialist report under Annexure 11.

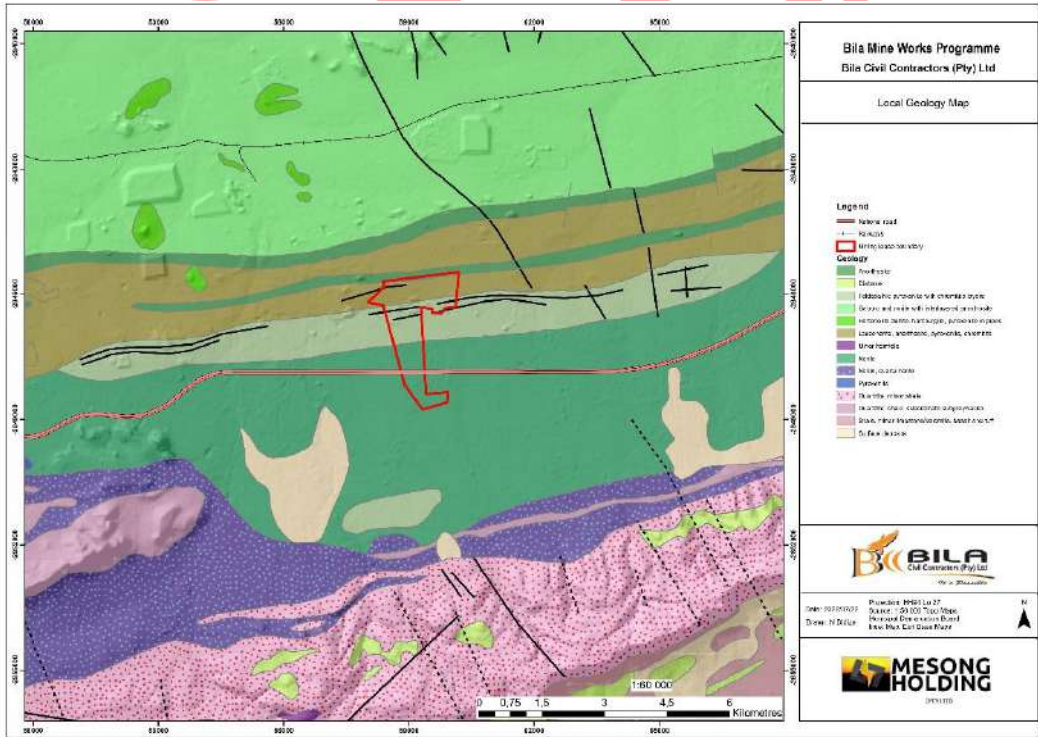


Figure 5: Mineral resource map (Appendix 9)

**D. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY.**

**i) LISTED AND SPECIFIED ACTIVITIES**

**Table 3: Listed and Specified Activities**

<p><b>Description of the overall activity. (Indicate Mining Right, Mining Permit, Prospecting right, Bulk Sampling, Production Right, Exploration Right, Reconnaissance permit, Technical co-operation permit, Additional listed activity)</b></p>	<p><b>Listing Notice 1 (GNR 327), Activity 19:</b> <i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i></p> <p><b>Listing Notice 1 (GNR 327), Activity 14:</b> <i>The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.</i></p> <p><b>Listing Notice 1 (GNR 327), Activity 24:</b> <i>The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;</i></p> <p><b>Listing Notice 2 (GNR 325), Activity 15:</b> <i>"The clearance of an area of 20 hectares or more, of indigenous vegetation."</i></p> <p><b>Listing Notice 2 (GNR 325), Activity 17 (Amended GNR 517: 2021):</b> <i>"Any activity including the operation of that activity which requires a mining right in terms of section 22 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice, in Listing Notice 1 of 2014 or Listing Notice 3 of 2014, required to exercise the mining right."</i></p> <p><b>Listing Notice 2 (GNR 325), Activity 19 (Amended GNR 517: 2021):</b> <i>"The removal and disposal of minerals which requires permission contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002, as well as any other applicable activity as contained in this Listing Notice, Listing Notice 1 of 2014 or in Listing Notice 3 of 2014, required to exercise the permission"</i></p> <p><b>Listing Notice 3 GNR 324, Activity 4:</b> <i>The development of a road wider than 4 metres with a reserve less than 13,5 metres, (h) North West (ii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (iv) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority;</i></p> <p><b>Listing Notice 3 (GNR 324), Activity 10:</b> <i>The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. (h) North West, (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; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.</i></p> <p><b>Listing Notice 3 (GNR 324), Activity 12:</b> <i>The clearance of an area of 300 square metres or more of indigenous vegetation; (h) North West (iv) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; (v) Sensitive areas as identified in an</i></p>
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	<p><i>environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.</i></p> <p>Mining right for the mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (From Waste Dumps) (STW) associated minerals within the orebody and including associated infrastructure, structure and earthworks.</p> <p><b>NEM:WA 59 of 2008</b></p> <p><u>Storage of hazardous waste</u></p> <ol style="list-style-type: none"><li>1. Category B: (1) The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.</li></ol> <p><u>Treatment of waste</u></p> <ol style="list-style-type: none"><li>2. Category B: (5) The treatment of hazardous waste in lagoons, excluding the treatment of effluent, wastewater or sewage.</li></ol> <p><u>Disposal of waste on land:</u></p> <ol style="list-style-type: none"><li>3. Category B: (7) The disposal of any quantity of hazardous waste to land.</li><li>4. Category B: (8) The disposal of general waste to land covering an area in excess of 200m<sup>2</sup> and with a total capacity exceeding 25 000 tons.</li><li>5. Category B: (9) The disposal of inert waste to land in excess of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.</li></ol> <p><u>Construction of facilities and associated structures &amp; infrastructure:</u></p> <p>Category B: (10) The construction of a facility for a waste management activity listed in Category B of this Schedule</p>
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<b>NAME OF ACTIVITY</b> (E.g. For prospecting - drill site, site camp, ablation facility, accommodation, equipment storage, sample storage, site office, access route etc...etc...etc E.g. for mining,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablation, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.)	<b>Aerial extent of the Activity</b> <b>Ha or m<sup>2</sup></b>	<b>LISTED ACTIVITY</b> (Mark with an X where applicable or affected).	<b>APPLICABLE LISTING NOTICE</b> (GNR 324, GNR 325 or GNR 326)	<b>WASTE MANAGEMENT AUTHORISATION</b> (Indicate whether an authorisation is required in terms of the Waste Management Act) (Mark with an X)
<b>Listing Notice 1 (GNR 327), Activity 19:</b> <i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i>	Extent of the proposed area is 304,8259 Hectares	X	<b>Listing Notice 1 (GNR 327), Activity 19</b>	
<b>Listing Notice 1 (GNR 327), Activity 14:</b> The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.  <b>This includes explosives, diesel etc</b>		X	<b>Listing Notice 1 (GNR 327), Activity 14</b>	
<b>Listing Notice 1 (GNR 327), Activity 24:</b> The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;  <b>These will include access &amp; haul roads</b>		X	<b>Listing Notice 1 (GNR 327), Activity 24</b>	
<b>Clearance of indigenous vegetation:</b>  <b>Listing Notice 2 (GNR 325), Activity 15:</b> "The clearance of an area of 20 hectares or more, of indigenous vegetation."		X	<b>Listing Notice 2 (GNR 325), Activity 15</b>	



<p><b>Listing Notice 2 (GNR 325), Activity 17 (Amended GNR 517: 2021):</b> “Any activity including the operation of that activity which requires a mining right in terms of section 22 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice, in Listing Notice 1 of 2014 or Listing Notice 3 of 2014, required to exercise the mining right.”</p> <p><b>Mining right for the mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (From Waste Dumps) (STW) &amp; associated minerals within the orebody</b></p> <p><b>Please see Annexure 5 for the list of equipment and infrastructure</b></p>		X	<p><b>Listing Notice 2 (GNR 325), Activity 17 (Amended GNR 517: 2021):</b></p>	
<p><b>Listing Notice 2 (GNR 325), Activity 19 (Amended GNR 517: 2021):</b> “The removal and disposal of minerals which requires permission contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002, as well as any other applicable activity as contained in this Listing Notice, Listing Notice 1 of 2014 or in Listing Notice 3 of 2014, required to exercise the permission”</p> <p><b>Please see Annexure 5 for the list of equipment and infrastructure.</b></p>		X	<p><b>Listing Notice 2 (GNR 325), Activity 19 (Amended GNR 517: 2021):</b></p>	
<p><b>Listing Notice 3 GNR 324, Activity 4:</b> The development of a road wider than 4 metres with a reserve less than 13,5 metres, <b>(h) North West (ii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (iv) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority;</b></p>		X	<p><b>Listing Notice 3 GNR 324, Activity 4</b></p>	
<p><b>Listing Notice 3 (GNR 324), Activity 10:</b> The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. <b>(h) North West, (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; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.</b></p> <p><b>This includes explosives, diesel etc that is stored within 100m of any water course or wetland</b></p>		X	<p><b>Listing Notice 3 (GNR 324), Activity 10</b></p>	
<p><b>Listing Notice 3 (GNR 324), Activity 12:</b> The clearance of an area of 300 square metres or more of indigenous vegetation; <b>(h) North West (iv) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; (v) Sensitive areas as identified in an environmental management</b></p>		X	<p><b>Listing Notice 3 (GNR 324), Activity 12</b></p>	

<p><i>framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.</i></p> <p><b>Clearance of indigenous vegetation</b></p>				
<p><b>NEM:WA 59 of 2008</b></p> <p><u>Storage of hazardous waste</u> Category B: (1) The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.</p> <p><b>Tailings storage facility.</b></p>			<p><b>NEM:WA 59 of 2008, Category B: (1)</b></p>	<p>X</p>
<p><b>NEM:WA 59 of 2008</b></p> <p><u>Treatment of waste</u> Category B: (5) The treatment of hazardous waste in lagoons, excluding the treatment of effluent, wastewater or sewage.</p>			<p><b>NEM:WA 59 of 2008, Category B: (5)</b></p>	<p>X</p>
<p><b>NEM:WA 59 of 2008</b></p> <p><u>Disposal of waste on land:</u> Category B: (7) The disposal of any quantity of hazardous waste to land.</p>			<p><b>NEM:WA 59 of 2008, Category B: (7)</b></p>	<p>X</p>
<p><b>NEM:WA 59 of 2008</b></p> <p><u>Disposal of waste on land:</u> Category B: (8) The disposal of general waste to land covering an area in excess of 200m<sup>2</sup> and with a total capacity exceeding 25 000 tons.</p>			<p><b>NEM:WA 59 of 2008, Category B: (8)</b></p>	<p>X</p>
<p><b>NEM:WA 59 of 2008</b></p> <p><u>Disposal of waste on land:</u> Category B: (9) The disposal of inert waste to land in excess of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.</p>			<p><b>NEM:WA 59 of 2008, Category B: (9)</b></p>	<p>X</p>
<p><b>NEM:WA 59 of 2008</b></p> <p><u>Construction of facilities and associated structures &amp; infrastructure:</u> Category B: (10) The construction of a facility for a waste management activity listed in Category B of this Schedule</p>			<p><b>NEM:WA 59 of 2008, Category B: (10)</b></p>	<p>X</p>

ii) **DESCRIPTION OF THE ASSOCIATED STRUCTURES AND INFRASTRUCTURE RELATED TO THE DEVELOPMENT**  
(Describe Methodology or technology to be employed, and for a linear activity, a description of the route of the activity)

According to the Mine Work Programme (MWP):

The existing prospecting right licence at Elandskraal was granted with accommodations for bulk sampling (NW30/5/1/1/2/12078PR). The prospecting activities deployed as a result of the bulk sampling exercise resulted in the trial mining of the mineral resources discovered and the testing of the mineral product into the market.

The mining operations, Elandskraal are therefore at trial mining stage (Prospecting Right), which intend on ramping into full mining production to 50, 000 tons of chrome ROM per month, if the proposed Mining Right is granted by the Department of Mineral Resources and Energy. A part of the infrastructure development required for the project has already been constructed as part of the work undertaken during the bulk sampling activities and trial mining under the existing prospecting right with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102)

## MINE DESIGN

### Opencast Strip Mining

The mining method will be an open cast hybrid between roll-over mining as well as bench mining with the potential for future underground mining to access chrome resources at depths of >80m. Mineral Resource for the proposed project is located within 2 group Seams [i.e. MG4 Seams (MG4A, MG4B & MG3) and MG2 Seams (MG2A, MG2B & MG2C)]. Seams MG0 & MG1 are excluded as they have been mined out by another mine.

The size of the void (trench) will be 800m (length) x 300m (width) at any given time.

The roll-over mining will be used where only one seam is present as well as where the overburden has a thickness less than 20m. The bench mining will be used where two or more seams are present and where the overburden has a thickness of more than 20m.

The stripping operation removes the topsoil and exposes the overburden of the next cut. The continuity of this process is essential in order to ensure that sufficient workroom is maintained. The initial topsoil will be hauled to a designated area and be used for rehabilitation later on.

When steady state is reached, topsoil is replaced in a continuous operation. The overburden will be drilled and blasted. The operation will be done in two phases. The top portion will be loaded and hauled; the lower portion will be done via a dozing process. This will ensure that the rehabilitation is adequately addressed by means of a backfilling process. Once the overburden has been removed, the run of mine will be transferred to the plant by means of a load and haul operation.

The accompanying figures are a schematic representation of the mining process after the first 4 cuts, at which a steady state will be reached.

As can be seen from the diagrams the following generic actions involved, are classified sequentially as follows:

- a) Strip top soil
- b) Remove sub-soil
- c) Drill and blast overburden
- d) Load and Haul the top off
- e) Doze the roll over
- f) Clean the top of the ROM
- g) Dig trench to prevent contamination
- h) Drill and blast ROM
- i) Load and haul ROM
- j) Start with next cut.

The following is a schematic layout – numbered steps 1 to 12.

1. Depicts a section through the general stratigraphic sequence. The mining direction is from the left to the right
2. The box-cut is now excavated after removal of the topsoil and the subsoil.
3. ROM is removed from the box-cut, subsoil from cut 2 and topsoil from cut 3.
4. The overburden of cut 2 is blasted.
5. The top part of the overburden is hauled to a stockpile as there is not enough pit room available.
6. The bottom part is dozed over and the chrome face is cleaned.

7. ROM is removed from cut 2 and subsoil from cut 3.
8. The Cut 3 overburden is blasted.
9. The top part of blasted overburden is hauled and placed at the beginning of the low wall.
10. The bottom part of cut 3 is dozed over and the chrome face cleaned.
11. ROM is removed from cut 3 and subsoil from cut 4.
12. Overburden of cut 4 is blasted. The pit is now in steady state and no more material is stockpiled as all can be accommodated in the pit. Rehabilitation now follows logically as soon as subsoil gets stripped in front it gets placed at the back. The same goes for the top soil which gets placed over the sub soil in a continuous process.

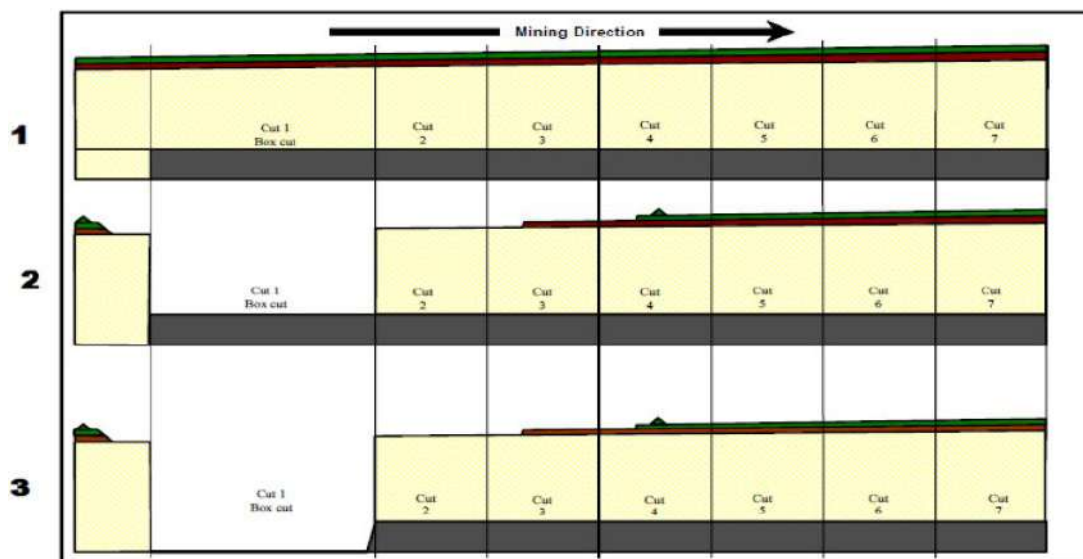


Figure 7.1a (MWP)

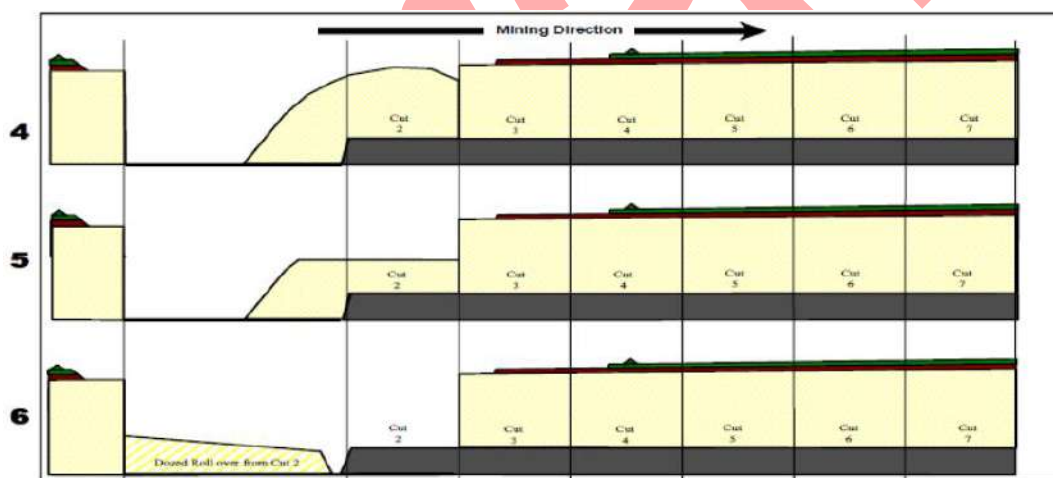


Figure 7.1ab (MWP)

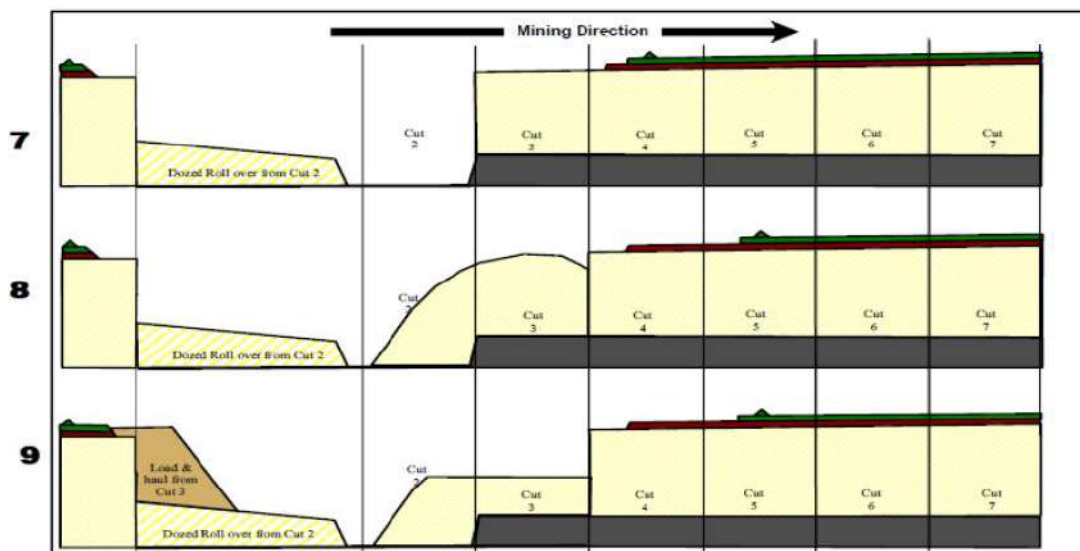


Figure 7.1c (MWP)

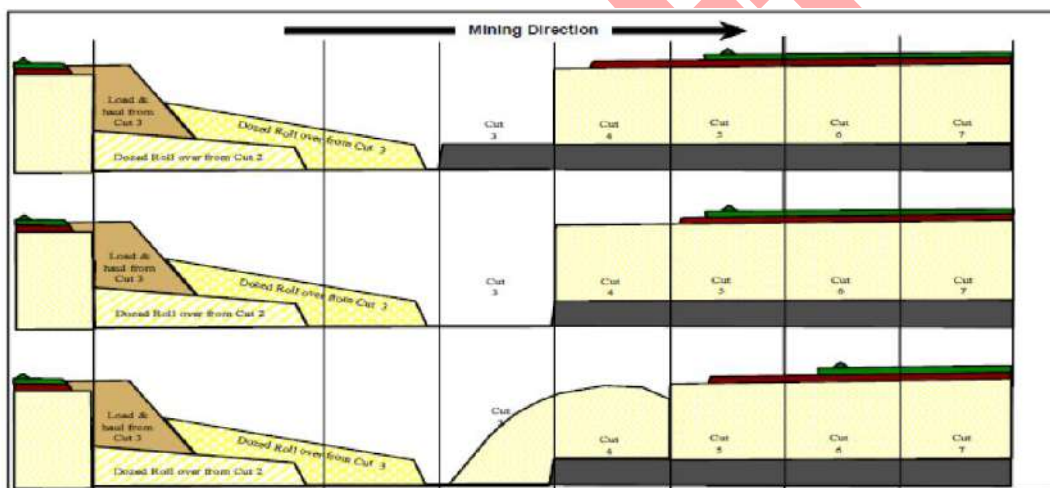
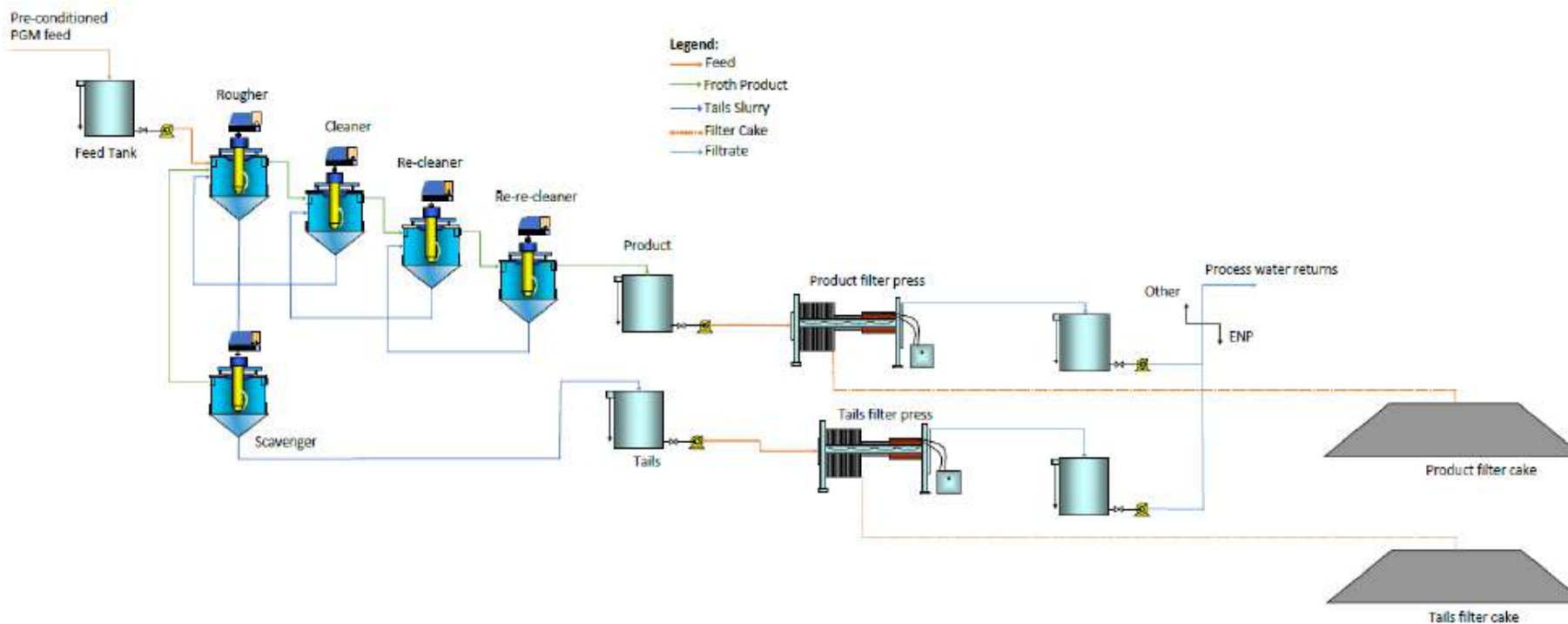


Figure 7.1d (MWP)



### Basic PGM Flotation plant Design



The processing plant will consist of the following systems:

- ROM Crushing and Screening system
- Milling
- DMS section
- Fines Treatment System
- Thickening
- Filtration
- Products and Discard Handling and Load-Out Systems
- Services (Water, Air, Flocculent and Magnetite)

The plant will be designed to treat 1.2 million tons per annum of ROM material. The ROM material at a top size of 300 mm will be received from on the mining operation. The ore will be crushed to -15 mm through a crushing and screening section. This material will then be fed to the washing plant for beneficiation. The material will be processed in the spiral plant to produce the products. The Coarse Tailings (-1 mm) will be removed and sold as construction aggregate material. The Fine Tailings (approximately – 200 microns) will be thickened and then sent to the PGM Processing Plant. The discard material from the PGM plant will be moved to the tailings dump. The company is working on establishing a local market to sell the tailing material from the plant.

- a) Pre-crushing  
Oversize material is reduced to -300mm using an excavator mounted breaker
- b) Crushing plant  
Currently using a mobile crushing plant consisting of jaw crusher and cone crusher and screens. -30mm reduced to -15mm  
In the medium term this will be replaced by a static crushing plant.
- c) Feeding  
Material transported through feed bunker onto conveyor belts leading to wetscreen
- d) Wet Screening  
6m x 2.4m wet screen with 0.8mm apertures screens material into the underpan
- e) Grinding  
Oversize material (+0.8mm -15mm) conveyed to ball mill or VSI crusher for further crushing and returned to wet screen on a closed circuit
- f) Spiral Plant Separation  
Slurry pumped from the screen underpan to top of spiral plant for spiral separation.
- g) Chemical and Metallurgical yield collected on the product pad to be sold to customers.
- h) Thickener  
Tailing slurry from the spiral plant is first put through a cyclone to extract the coarse tailings.  
Remaining slurry is directed to thickener to settle the fine tailings which are then deposited in the tailings pond. Fine tailings will be sold as PGM rich material.

#### **Summary of the PGM Wash Plant Processing:**

The tailings stream received from chrome spiral plant is planned to contain approximately 2.5g/t PGM's at 16-20 t/h which will report to the filtration system for filtering and water recovery. Instead of selling the tails to the nearest PGM recovery plant, it is worthwhile to consider beneficiation of the PGM's on site.

Our initial flotation model estimates approximately 400 PGM ounces can be beneficiated per month at a concentrate grade of 100g/t 4E. At the current PGM basket price, this can be sold for around R13million per month.

The project is still at conceptual stage at the moment and is to be further developed by our technical service providers. The final plant design and model are still under development.

#### **Explanation of the production build up period once production commences**

The operation will start with deployment of the necessary technical team and acquisition of new equipment desired to increase the capacity of the mine production to reach the full capacity of the processing plant as well and services currently existing customers procuring chrome ROM from the operation.

The water and electricity facilities currently available at the mine are not designed to the specifications of the planned full capacity of the operation. The company therefore intends on addressing those challenges to suitable capacities. This will also be applied to the associated infrastructure development facilities planned to facilitate the planned growth, such the roads, ROM and product application areas, the weigh-bridge etc.



**Drilling and blasting information.**

Drilling operation entails the following:

Number of days per week:	7 days
Number of drill holes per day:	4 rigs drilling 220m each per day
Diameter of drill that will be used (mm):	140mm diameter
Total area that will be drilled (m2):	Varies depending of depth 1200m <sup>2</sup> per day @ 15m deep holes 600m <sup>2</sup> per day @ 7m deep holes

Blasting operation:

Number of days per week:	1-2 day per week
Blasting hours:	16:00hrs – 17:00hrs
Number of blasts per day:	1
Length of area to be blasted:	50m
Width of area to be blasted:	50m

**Work hours / Operation hours**

Construction:	7 days/week (Mon – Sun), 10 hours/day (07:00 – 17:00)
Mining and Processing Plant Operations:	24 hrs/day, 7 days/week (Mon – Sun) 20 days per month
Hauling hours	18 hours/day and 7 days a week
Life of Mine:	~17 – 20 years (steady state production will be from Year 3 – Year 17).

**The infrastructure required for the proposed mining operation is summarized below.**

Contracted mining equipment will be supplied by the mining contractor and the costing thereof will be included in the contractors unit rates.

**Stores and Material:**

A containerized store will be provided by the contractor, in the contractor’s yard, to hold a limited store of high use items such as oils, grease, air filters etc. These stores will meet the requirements of the various health and safety and environmental legislation.

The following activity was applied for however may not be triggered:

**Listing Notice 3 (GNR 324), Activity 10:** *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. (h) North West, (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; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.*

During the mining activities, limited quantities of diesel and fuel, oil and lubricants will be stored on site. These goods should be placed in a bunded area one and a half times the volume of the total amount of goods to be stored.

**Electricity:**

Generators will be used on the property to supply the crushing and screening plant and other infrastructures with electricity.

**Water:**

Potable water will be supplied from a borehole located near to the contractor’s yard. Water for dust suppression will be sourced from the pollution control dam.

Water will be used for the following: drilling, watering down, dust suppression, general consumption; cleaning and washing; watering of office garden, Cleaning of equipment, dust suppression, etc.

A Water Use License Application (WULA) was submitted to DWS for the mining activities.

### **Waste**

An Integrated Water and Waste Management Plan (IWWMP) dated August 2022 compiled by GKM Consulting (Pty) Ltd was submitted at DWS.

The following NEM:WA (Act 59 of 2008) waste activities were applied for in the Environmental Authorisation application for the proposed Mining Right:

#### **Storage of hazardous waste**

- Category B: (1) The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.

#### **Treatment of waste**

- Category B: (5) The treatment of hazardous waste in lagoons, excluding the treatment of effluent, wastewater or sewage.

#### **Disposal of waste on land:**

- Category B: (7) The disposal of any quantity of hazardous waste to land.
- Category B: (8) The disposal of general waste to land covering an area in excess of 200m<sup>2</sup> and with a total capacity exceeding 25 000 tons.
- Category B: (9) The disposal of inert waste to land in excess of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.

#### **Construction of facilities and associated structures & infrastructure:**

- Category B: (10) The construction of a facility for a waste management activity listed in Category B of this Schedule

Please note the establishment or reclamation of residue stockpiles or residue deposits will still take place, but the activity is exempt from the list of Waste Management Activities Act 59 of 2008 (GNR 921, as amended)

### **Access Roads:**

An access road will be established using an existing intersection. The costing of the access roads is included in the mining contractor's site establishment costing.

The following activity was applied for however may not be triggered:

**Listing Notice 1 (GNR 327), Activity 24:** The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;

**Listing Notice 3 GNR 324, Activity 4:** *The development of a road wider than 4 metres with a reserve less than 13,5 metres, (h) North West (ii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (iv) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority;*

### **Workshop:**

A workshop (10m x 10m) will be established in the contractor's yard. The workshop will have a concrete floor and will be enclosed. The workshop will be used for servicing of vehicles and other on-site repairs and maintenance. The costing of the workshop is included in the mining contractor's site establishment costing.

### **Offices:**

The contractor will provide a mobile office (4 x 10m), the price of which has been included in the contractor's site establishment costing. A mobile office for the weighbridge will be established by the contractor and is included in the site establishment costing.

### **Dust Suppression**

Dust suppression measures will be implemented. Dust suppression via water sprays on the unpaved routes using 14KL and 35KL water carts (using water from PCDs) is planned. Furthermore, wet beneficiation is planned to be used at the processing plant, which will minimise fugitive dust emissions from processing operations.

### **Dustfall Monitoring**

In terms of ambient monitoring, dustfall monitoring is recommended prior to full mining production to determine baseline dustfall rates at the project site. In terms of the Draft National Dust Control Regulations, monthly dustfall monitoring should be undertaken using the ASTM D1739-98 (reapproved 2017) method.

Unacceptable levels of dust fallout can be determined by implementing dust management by monitoring compliance with the requirements of the National Dust Control Regulations for an activity, in terms of nuisance or disturbance.

The National Framework for Air Quality Management in the Republic of South Africa (the National Framework), as published under Government Notice No. 1144 of 26 October 2018, underpins NEM:AQA by providing national norms and standards for air quality management to ensure compliance with legislation. The National Framework serves as the country’s AQMP.

Section 32 of the NEM:AQA makes provision for the Minister or the MEC to prescribe measures for the control of dust in specific places or areas, or by specified machinery or in specific instances. While dust generally does not pose a health risk, it may be regarded as a nuisance. It is the responsibility of the owner of the dust generating activity to take reasonable measures to limit the nuisance factor.

With respect to this, the Minister has published in the gazette the regulations for the control of dust in 2013 (Notice 827, Government Gazette No. 36974). These regulations provide requirements for measures for the control of dust, which includes the requirements for monitoring, dust management plan development and implementation and reporting.

According to dust levels set out by the National Dust Control Regulations 2013 (GNR. 827). The limits have the following threshold Section 3. Dustfall standard

**Table 1. Acceptable dust fall rates**

<b>Restriction Areas</b>	<b>Dustfall rate (D) (mg/m<sup>2</sup>/day, 30-day average)</b>	<b>Permitted frequency of exceeding dust fall rate</b>
Residential Area	$D < 600$	Two within a year, not sequential months
Non-residential Area	$600 < D < 1200$	Two within a year, not sequential months

**Current management of Dirty Water**

An Integrated Water and Waste Management Plan (IWWMP) dated August 2022 compiled by another consulting company was submitted at DWS.

*Stormwater runoff from the Wash plant, Workshop, Stockpiles and Mine Pit areas is regarded as dirty water since it contains contaminants from the mining activities. This stormwater runoff shall be collected and contained as per the design criteria and in compliance to the principle number two of the BPG - G1: (DWA, August 2006).*

- Channels around the wash plant, workshop and stockpiles collect dirty water and convey it to the pollution control dam.
- The slope falling away from the pit/s diverts clean water runoff from entering the pits. The dirty water that will be collected in the pit/s is pumped into a process water dam for reuse on the wash plant area.
- Berm walls constructed for the waste dumps keep runoff water from getting into the surrounding environment. The waste dump material is not considered to have contaminants requiring its runoff to be directed to the Pollution Control Dam (PCD), since it consists of naturally occurring materials that have just been displaced. The water from these areas is pumped out by means of dewatering pumps and transported to the process dams.
- Diversion berms around the pit/s must keep all residue away from the 1:100 year flood of the stream and keep mining activity runoff from reaching the stream.

The Stormwater Management Plan compiled for the Water Use License Application (WULA) includes the Pollution Control Dam (PCD). A Phase 1 Engineering Geological Investigation was conducted in 2020 by Mabu Geotechnical Consultancy for the Pollution Control Dam.

*The PCD were designed to contain a flood of 1 in 50 years with a freeboard allowance of 0.8m as per Regulation GN 704. The sizes of the clean water channels were calculated to carry peak discharges from 1 in 50-year flood events.*

**Mining activities and phases**

Please find the Mining Work Programme attached as **Appendix 9**.

**Mine Health and Safety**

Bila Civil Contractors (Pty) Ltd must comply with the Mine Health and Safety Act, 29 of 1996 Regulations. The duties/functions are imposed on/assigned to Bila Civil Contractors (Pty) Ltd.

Bila Civil Contractors (Pty) Ltd shall appoint its own experts, including rock engineers, mine health and safety specialists, mine managers, geologists, mine surveyors, etc.

The current pit layout indicates that the planned pit areas may be close to private installations. The Mine Health and Safety Act has specific requirements regarding blasting within 500m from private installations. This condition is addressed in the recommendations of the Blast Impact Assessment (**Appendix 11**).

### **Mine Health and Safety Regulations**

Mining and blasting activities must comply with the Mine Health and Safety Act 29 of 1996. The following are noted: (where possible detail was omitted and only some of the information indicated)

#### **Chapter 4 Explosives**

##### **Precautionary measures before initiating explosive charges:**

4.7 The employer must take reasonable measures to ensure that when blasting takes place, air and ground vibrations, shock waves and fly material are limited to such an extent and at such a distance from any building, public thoroughfare, railway, power line or any place where persons congregate to ensure that there is no significant risk to the health or safety of persons.

##### **General precautions**

4.16 The employer must take reasonable measures to ensure that:

4.16(1) in any mine other than a coal mine, no explosive charges are initiated during the shift unless –

- (a) such explosive charges are necessary for the purpose of secondary blasting or reinitiating the misfired holes in development faces;
- (b) written permission for such initiation has been granted by a person authorised to do so by the employer; and
- (c) reasonable precautions have been taken to prevent, as far as possible, any person from being exposed to smoke or fumes from such initiation of explosive charges;

4.16(2) no blasting operations are carried out within a horizontal distance of 500 metres of any public building, public thoroughfare, railway line, power line, any place where people congregate or any other structure, which it may be necessary to protect in order to prevent any significant risk, unless:

- (a) a risk assessment has identified a lesser safe distance and any restrictions and conditions to be complied with;
- (b) a copy of the risk assessment, restrictions and conditions contemplated, in paragraph (a) have been provided for approval to the Principal Inspector of Mines;
- (c) shot holes written permission has been granted by the Principal Inspector of Mines; and
- (d) any restrictions and conditions determined by the Principal Inspector of Mines are complied with.

#### **Chapter 17 Surveying, Mapping and Mine Plans**

##### **Safety Precautions**

##### **Responsibilities regarding safety precautions**

17(5) The employer must take reasonable measures to ensure that the competent person referred to in regulation 17(2)(a) is at all times aware of-

- (a) workings which are being advanced;
- (b) surface structures or objects which may be affected by mining;
- (c) workings which are being abandoned or closed down, in order to allow the final surveying thereof;
- (d) all workings or any place on surface where there is, or is likely to be, a dangerous accumulation of fluid material, noxious or flammable gas; and
- (e) safety pillars that are being, or have been, removed.

17(6) The employer must take reasonable measures to ensure that the competent person referred to in regulation 17(2)(a) in writing notifies the employer, which notification must be dated, of any workings being advanced to come within:

- (a) a horizontal distance of 100 (one hundred) metres from reserve land, buildings, roads, railways, dams, waste dumps or any other structure whatsoever including structures beyond the mining boundaries, or from any surface, which it may be necessary to protect in order to prevent any significant risk.
- (b) 50 (fifty) metres from any excavation, workings, restricted area or any other place where there is, or is likely to be a dangerous accumulation of fluid material, noxious or flammable gas. Such notification must include a sketch plan giving the distance to such place from the nearest survey station.

17(7) The employer must take reasonable measures to ensure that -

- (a) no mining operations are carried out within a horizontal distance of 100 (one hundred) metres from reserve land, buildings, roads, railways, dams, waste dumps, or any other structure whatsoever including such structures beyond the mining boundaries, or any surface, which it may be necessary to protect in order to prevent any significant risk, unless a lesser distance has been determined safe by risk assessment and all restrictions and conditions determined in terms of the risk assessment are complied with;

(b) workings coming within 50 (fifty) metres, from any other excavation, workings, restricted area or any other place where there is, or is likely to be a dangerous accumulation of fluid material, noxious or flammable gas are mined subject to such restrictions and stopped at such positions as determined by risk assessment.

(c) where ground movement, as a result of mining operations, poses significant risk, an effective ground movement monitoring system is in place.

(d) survey records and plans relating to conditions described in paragraphs (a) and (b) above, are made available to the persons doing the risk assessment.

17(8) No person may erect, establish or construct any buildings, roads, railways, dams, waste dumps, reserve land, excavations or any other structures whatsoever within a horizontal distance of 100 (one hundred) metres from workings, unless a lesser distance has been determined safe -

(a) in the case of the employer, by risk assessment and all restrictions and conditions determined in terms of the risk assessment are complied with; or

(b) in the case of any other person, by a professional geotechnical specialist and all restrictions and conditions determined by him or her or by the Chief Inspector of Mines are complied with;

17(9) The person(s) responsible for activities in terms of regulations 17(7)(a) and 17(8) must –

(a) in the case of an employer, provide the Chief Inspector of Mines with the distance and accompanying restrictions and conditions for comment, and;

(b) in the case of other persons, provide the Chief Inspector of Mines with the distance and accompanying restrictions and conditions for approval.

17(10) No mining operations, erecting, establishment, or construction, as contemplated in regulations 17(7)(a) and 17(8) respectively, may take place until such written comment or approval, as referred to in 17(9)(a) and 17(9)(b), has been obtained.

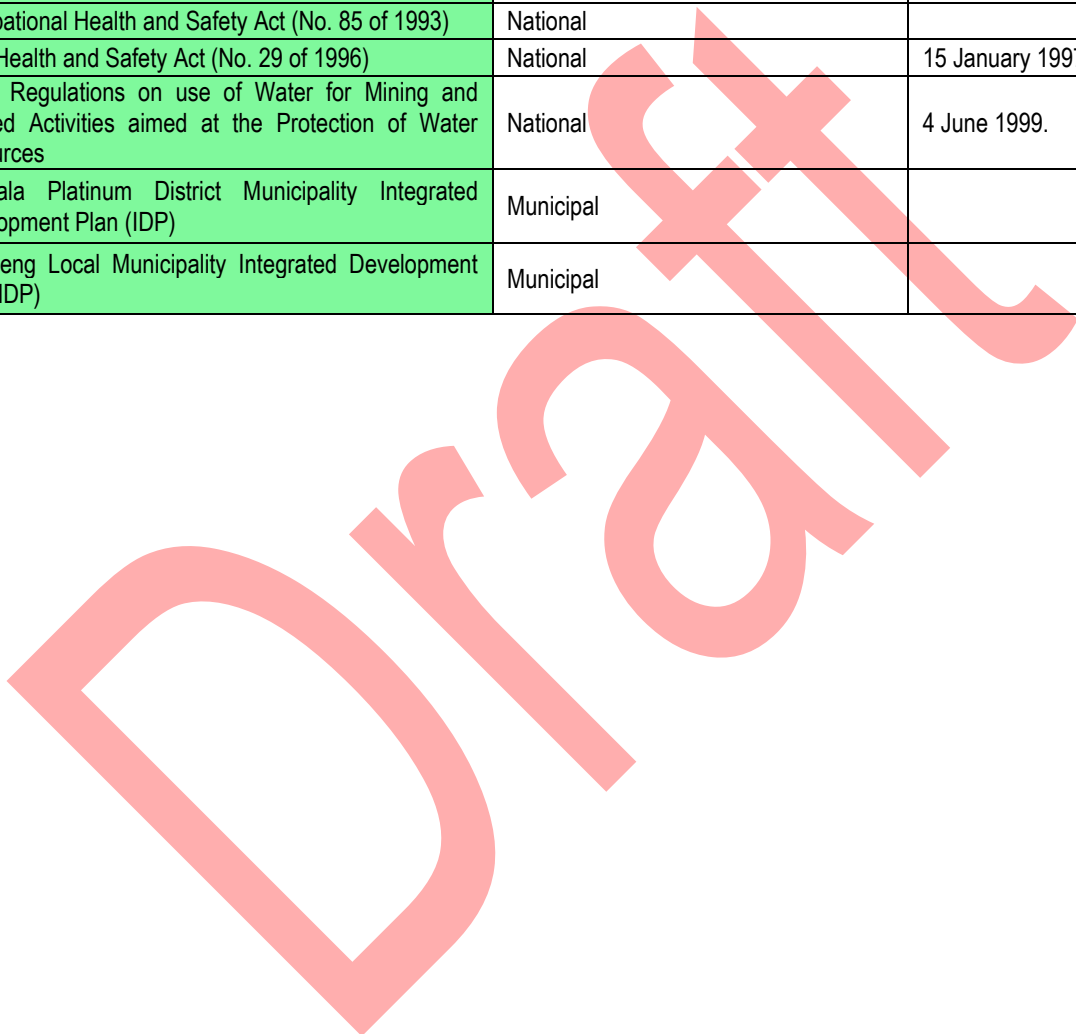
#### A. POLICY AND LEGISLATIVE CONTEXT

(a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;)

**Table 4: Policy and Legislative Context**

Title of legislation, policy or guideline:	Administering authority:	Promulgation Date:
Constitution of South Africa Act 108 of 1996	National	18 December 1996
National Environmental Management Act No. 107 of 1998	National	29 January 1999
EIA regulations under NEMA	National	14 December 2014
Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)	National	1 May 2004
Mineral and Petroleum Resources Development Regulations, 2014.	National	23 April 2004
The National Heritage Resources Act (Act No. 25 of 1999)	National & Provincial	1 April 2000
National Environmental Management Waste Act, 2008 (Act No. 59 of 2008)	National	1 July 2009
NEM:WA (Act No. 59 of 2008) Regulations regarding the Planning & Management of Residue Stockpiles & Residue Deposits from a Prospecting, Mining, Exploration or Production Operation	National & Provincial	24 July 2015
National Environmental Management: Biodiversity Act No. 10 of 2004	National	1 September 2004
National Environmental Management Air Quality Act, 2004 (Act No. 39 of 2004).	National and Provincial	11 September 2005
National Water Act, 1998 (Act No. 36 of 1998).	National	6 December 1999

National Forest Act (Act 84 of 1998) (NFA)	National	1 April 1999
National Veld & Forest Fires Act (Act 101 of 1998)	National	27 November 1998
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	National	1 June 1984
National Infrastructure Plan	National	11 March 2022
National Environmental Management: Protected Areas Act 57 of 2003	National	1 November 2004
Hazardous Substances Act (No. 15 of 1979), Amended	National	4 April 1973
Subdivision of Agricultural Land Act (No. 70 of 1970)	National	2 January 1971
Occupational Health and Safety Act (No. 85 of 1993)	National	
Mine Health and Safety Act (No. 29 of 1996)	National	15 January 1997
NWA: Regulations on use of Water for Mining and Related Activities aimed at the Protection of Water Resources	National	4 June 1999.
Bojanala Platinum District Municipality Integrated Development Plan (IDP)	Municipal	
Madibeng Local Municipality Integrated Development Plan (IDP)	Municipal	



**POLICY AND LEGISLATIVE CONTEXT**

Title of legislation, policy or guideline:	Reference where applied	How does this development comply with and respond to the legislation and policy context.	Reference where applied
Constitution of South Africa Act 108 of 1996	Section 24	<p>The Constitution is the supreme law of the Republic and all law and conduct must be consistent with the Constitution. The Chapter on the Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment. Section 24 of the Constitution of the Republic of South Africa (Act 108 of 1996) states the following:</p> <p><i>“Everyone has the right –</i></p> <p><i>(a) to an environment that is not harmful to their health or well-being; and</i></p> <p><i>(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –</i></p> <p><i>i) prevent pollution and ecological degradation;</i></p> <p><i>ii) promote conservation; and</i></p> <p><i>iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”</i></p> <p>The Constitution therefore, compels government to give effect to the people’s environmental right and places government under a legal duty to act as a responsible custodian of the countries environment. It compels government to pass legislation and use other measures to protect the environment, to prevent pollution and ecological degradation, promote conservation and secure sustainable development.</p>	Throughout the EIA process
National Environmental Management Act No. 107 of 1998 as amended.	S24(1) of NEMA S28(1) of NEMA	<p>In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential consequences for or impacts on the environment of listed activities or specified activities must be considered, investigated, assessed and reported on to the competent authority or the Minister responsible for mineral resources, as the case may be, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of this Act.</p> <p>Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.</p>	Throughout the EIA process
EIA regulations as amended under NEMA	Listing notice 1 Listing notice 2 Listing Notice 3	<p>The National Environmental Management Act 107 of 1998 (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially detrimental to the environment. These activities are detailed in Listing Notice 1 (as amended by GNR 327 of 7 April 2017), Listing Notice 2 (as amended by GNR325 of 7 April 2017) and Listing Notice 3 (as amended by GNR324 of 7 April 2017). Undertaking activities specified in the Listing Notices are only allowed once Environmental Authorisation has been obtained from the competent authority. Such Environmental Authorisation will only be considered once there has been compliance with the EIA Regulations, 2014. The Environmental Authorisation which may be granted subject to conditions.</p>	Throughout the EIA process

<p>Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)</p>	<p>Section 10, 16, 22, 27, 38A and 48</p>	<p>Any person who wishes to apply to the Minister for a prospecting right, mining right or mining permit must simultaneously apply for an environmental authorisation and must lodge the application -</p> <p>Once the application is accepted, an Environmental Impact Assessment (BAR or EIR process), including stakeholder consultation and reporting, must be conducted as per Chapter 5 of the National Environmental Management Act, 1998 (NEMA).</p>	<p>Throughout the EIA process</p>
<p>Mineral and Petroleum Resources Development Regulations, 2014.</p>	<p>Regulations 3, 5, 10 and 14</p>	<p>MPRDA Regulations prescribe how an application for a permit or right must be lodged.</p>	<p>Throughout the EIA process</p>
<p>The National Heritage Resources Act (Act No. 25 of 1999)</p>	<p>Section 35 Section 38</p>	<p>The National Heritage Resources Act (Act No 25 of 1999, Section 35) protects South Africa's unique and non-renewable archaeological and palaeontological heritage sites. These sites may not be disturbed without a permit from the relevant heritage resources authority. Section 38 of the NHRA provides guidelines for Cultural Resources Management and proposed developments:</p>	<p>Throughout the EIA process</p>
<p>National Environmental Management Waste Act, 2008 (Act No. 59 of 2008)</p>	<p>Category A Category B Category C</p>	<p>Section 24S of NEMA deals with the management of residue stockpiles and residue deposits and provides that Residue stockpiles and residue deposits must be deposited and managed in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), on any site demarcated for that purpose in the environmental management plan or environmental management programme in question.</p> <p>The management of residue stockpiles and residue deposits must be done in accordance with any conditions set out and any identified measures in the environmental authorisation issued in terms of NEMA, an environmental management programme and a waste management licence issued in terms of NEMA (Regulation 3(2)).</p> <p>The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) regulates waste management in all aspects and created a list of waste management activities that have, or are likely to have, a detrimental effect on the environment, which requires an impact assessment and licensing process. Activities listed in Category A require a Basic Assessment process, activities listed in Category B require a Scoping and EIA process and activities under Category C must comply with the relevant requirements or standards, in order for competent authorities to consider an application in terms of NEM:WA.</p>	<p>Throughout the EIA process</p>
<p>NEM:WA (Act No. 59 of 2008) Regulations regarding the Planning &amp; Management of Residue Stockpiles &amp; Residue Deposits from a Prospecting, Mining, Exploration or Production Operation</p>		<p>The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation.</p>	<p>Throughout the entire EIA process.</p>



<p>National Environmental Management: Biodiversity Act No. 10 of 2004</p>	<p>Chapter 4 Chapter 5</p>	<p>The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) is part of a suite of legislation falling under NEMA. The Act provides for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant protection; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith (SANBI).</p> <p>Chapter 4 of NEMBA deals with threatened and protected ecosystems and species to ensure the maintenance of their ecological integrity, their survival in the wild, the utilisation of biodiversity is managed in an ecologically sustainable way and to regulate international trade in specimens of endangered species. Chapter 5 of NEMA deals with species and organisms posing potential threats to biodiversity. The purpose of this chapter is to prevent the introduction and spread of alien species and invasive species, also to manage, control and eradicate alien species and invasive species</p>	<p>Throughout the EIA process</p>
<p>National Environmental Management Air Quality Act, 2004 (Act No. 39 of 2004).</p>	<p>Section 21</p>	<p>The object of this Act is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development.</p> <p>Regulations No. R248 (of 31 March 2010) promulgated in terms of Section 21(1) (a) of the National Environmental Management Act: Air Quality Act (39 of 2004) determine that an Atmospheric Emission License (AEL) is required for certain listed activities, which result in atmospheric emissions which have or may have a detrimental effect on the environment. The Regulation also sets out the minimum emission standards for the listed activities. It is not envisaged that an Atmospheric Emission License will be required for the proposed development.</p>	<p>Throughout the EIA process</p>
<p>National Water Act, 1998 (Act No. 36 of 1998).</p>	<p>Section 21</p>	<p>Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. The intention of the Act is to promote the equitable access to water and the sustainable use of water, redress past racial and gender discrimination, and facilitate economic and social development. The Act provides the rights of access to basic water supply and sanitation, and environmentally, it provides for the protection of aquatic and associated ecosystems, the reduction and prevention of pollution and degradation of water resources.</p> <p>As this Act is founded on the principle that National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, a person can only be entitled to use water if the use is permissible under the Act. Chapter 4 of the Act lays the basis for regulating water use.</p>	<p>Throughout the EIA process</p>

National Forest Act (Act 84 of 1998) (NFA)	Regulation 7	<p>The protection, sustainable management and use of forests and trees within South Africa are provided for under the National Forests Act (Act 84 of 1998).</p> <p>Regulation 7 from the Act states the following:</p> <p><b>Prohibition on destruction of trees in natural forests.</b></p> <p>(1) No person may -</p> <p>(a) cut, disturb, damage or destroy any indigenous tree in a natural forest; or</p> <p>(b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any tree, or any forest product derived from a tree contemplated in paragraph (a), except in terms of-</p> <p>(i) a licence issued under subsection (4) or section 23; or</p> <p>(ii) an exemption from the provisions of this subsection published by the Minister in the Gazette on the advice of the Council.</p>	Throughout the EIA process
National Veld & Forest Fires Act (Act 101 of 1998)	Regulation 13 Chapter 5	<p>The purpose of the Act is to prevent and combat veld, forest and mountain fires throughout the Republic and provides for a variety of institutions, methods and practices for achieving the purpose. Regulations 13 provides the requirement for firebreaks. Chapter 5 places a duty on all owners to acquire equipment and have available personnel to fight fires.</p>	Throughout the EIA process
Conservation of Agricultural Resources Act (Act No. 85 of 1983)		<p>The purpose of the Act is to provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.</p> <p>The objects of this Act are to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.</p>	Throughout the EIA process
National Infrastructure Plan		<p>The National Government adopted a National Infrastructure Plan in 2012. With the plan they aim to transform the South African economic landscape while simultaneously creating significant numbers of new jobs, and strengthening the delivery of basic services.</p> <p>This mining activity will indirectly contribute to the growing of the South African economy.</p>	Throughout the EIA process
National Environmental Management: Protected Areas Act 57 of 2003		<p>This Act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. It also seeks to provide for the sustainable utilization of protected areas and to promote participation of local communities in the management of protected areas.</p>	Throughout the EIA process
Hazardous Substances Act (No. 15 of 1979)		<p>The object of the Act is inter alia to '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 sensitising or flammable nature or the generation of pressure thereby in certain circumstances; for the control of electronic products; for the division of such substances or products into groups in relation to the degree of danger; for the prohibition and control of such substances.'</p> <p>In terms of the Act, substances are divided into schedules, based on their relative degree of toxicity, and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule.</p>	Throughout the EIA process

Subdivision of Agricultural Land Act (No. 70 of 1970)		This Act regulates the subdivision of agricultural land and its use for purposes other than agriculture. The Directorate of Resource Conservation is responsible for the enforcement thereof. Investigations are done by the Provincial Department in support of the execution of the Act. The Act also deals with aspects associated with rezoning land.	Throughout the EIA process
Occupational Health and Safety Act (No. 85 of 1993)		<p>The Occupational Health and Safety Act (No. 85 of 1993) (OHSA) provides a legislative framework for the provision of reasonably healthy and safe conditions in the workplace. It also places extensive legal duties on employees and users of machinery and makes major inroads on employers' and employees' common law rights.</p> <p>The OHSA is applicable and states that any person involved with construction, upgrades or developments for use at work or on any premises shall ensure as far as reasonably practicable that nothing about the manner in which it is installed, erected or constructed makes it unsafe or creates a risk to health when properly used</p>	EMPr.
Mine Health and Safety Act (No. 29 of 1996)		<p>The Mine Health and Safety Act (No. 29 of 1996) (MHSA) aims to protect and promote the health and safety of employees and persons that may be affected by the activities at a mine and outlines both the rights and responsibilities of an employer, as well as the obligations of employees working thereat.</p> <p>The following principles are considered applicable to the Proposed Project and are detailed below:</p> <ul style="list-style-type: none"> <li>• The primary responsibility for ensuring a health and safe working environment in the mining site is placed on the mine owner. The Act sets out in detail the steps that employers must take to identify, assess records and control health and safety hazards in the mine;</li> <li>• The right of workers to participate in health and safety decisions, the right to receive health and safety information, the right to training and the right to withdraw from the workplace in face of danger;</li> <li>• The Act requires the establishment of institutions to promote a culture of health and safety and develop policy, legislation and regulations; and</li> <li>• The responsibility for enforcing MHSA lies with the Mine Health and Safety Inspectorate. The Inspectorate's powers are recast and include the power to impose administrative fines upon employers who contravene the MHSA.</li> </ul> <p>The Act also contains innovative approaches to the investigation of accidents, diseases and other occurrences that threaten health and safety.</p>	EMPr.
Regulations on use of Water for Mining and Related Activities aimed at the Protection of Water Resources		<p>GNR.704 of 1999 under the NWA provides regulations on the use of water for mining and related activities aimed at the protection of water resources (requirements for clean and dirty water separation). GNR.704 requires inter alia the following:</p> <ul style="list-style-type: none"> <li>• Separation of clean (unpolluted) water from dirty water;</li> <li>• Collection and confinement of the water arising within any dirty area into a dirty water system;</li> <li>• Design, construction, maintenance and operation of the clean water and dirty water management systems so that it is not likely for either system to spill into the other more than once in 50 years;</li> <li>• Design, construction, maintenance and operation of any dam that forms part of a dirty water system to have a minimum freeboard of 0.8m above full supply level, unless otherwise specified in terms of Chapter 12 of the Act; and</li> </ul>	Throughout the EIA process

		<ul style="list-style-type: none"> <li>Design, construction, and maintenance of all water systems in such a manner as to guarantee the serviceability of such conveyances for flows up to and including those arising as a result of the maximum flood with an average period of recurrence of once in 50 years.</li> </ul> <p><u>GNR.704 also stipulates that no person in control of a mine or activity may:</u>          Locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood line or within a horizontal distance of 100m from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;</p> <p>Place or dispose of any residue or substance which causes or is likely to cause pollution of a water resource, in the workings of any underground or opencast mine excavation, prospecting diggings, pit or any other excavation; or</p> <p>Use any area or locate any sanitary convenience, fuel depots, reservoir or depots for any substance which causes or is likely to cause pollution of a water resource within the 1:50 year flood line of any watercourse or estuary.</p>	
District Municipality Integrated Development Plan (IDP)		The IDP and SDFs of the relevant municipalities was examined and relevant information was included in the EIA report.	EIA report.
Local Municipality Integrated Development Plan (IDP)		The IDP and SDFs of the relevant municipalities was examined and relevant information was included in the EIA report.	EIA report.

## **B. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES.**

(a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred [location] development footprint within the approved site as contemplated in the accepted scoping report;).

Mining has played a vital role in the economy of South Africa for over 100 years. In 2015 the mining industry contributed R286 billion towards South African Gross Domestic Product (GDP) representing 7.1% of overall GDP. Mining is a significant contributor to employment in the nation, with 457 698 individuals directly employed by the sector in 2015. This represents just over 3% of all employed nationally. (Chamber of Mines, South Africa, 17:2016)

### **Chrome ore**

According to the Chamber of mines: Facts and Figures, 2016: Employment figures for chrome mining was 15,514 in 2016 (Chamber of Mines, South Africa, 35:2017)

Chrome is known for its high corrosion resistance and hardness. It is essential in the production of stainless steel, which accounts for 85% of its commercial use. Around 70% of the world's chrome resources can be found in South Africa. South Africa is also the largest producer of chrome globally. (Chamber of Mines, South Africa, 16:2016)

### **Platinum Group Metals (PGM)**

The Bushveld Igneous Complex, formed some 2 billion years ago, is the world's largest layered intrusion, created when vast quantities of molten rock from the earth's mantle was brought to the surface through long vertical cracks or intrusions (Chamber of Mines, South Africa, 10:2016).

In South Africa, the discovery of the first platinum nuggets dates back to 1924. Geologist Hans Merensky's follow-up work resulted in the discovery of the Bushveld Igneous Complex. This complex hosts more than half the world's platinum group metals (PGMs) and associated minerals, such as nickel, chromium, vanadium and refractory minerals. In fact, South Africa is host to around 80% of the world's known platinum reserves (Chamber of Mines, South Africa, 10:2016).

Six noble metals, all silvery-white in appearance, constitute PGMs – platinum, palladium, rhodium, ruthenium, osmium and iridium. Platinum, palladium and rhodium are the primary metals of significant economic value. They are used largely for jewellery and in the automotive industry for their excellent catalytic properties. Other uses include investment (coins and bars), fuel cells, and many other industrial purposes (Chamber of Mines, South Africa, 10:2016).

In the last 10 years employment in the sector increased from 168,530 employees in 2006, to over 172,310 in 2016 (Chamber of Mines, South Africa, 19:2017).

Prospecting and mining activities for chrome ore and Platinum Group Metals (PGM) takes place in the facility of the proposed area which suggest the possibility of encountering further chrome deposits.

The North West Province is an important supplier of chrome and Platinum Group Metals (PGM) to the international market and is a large corner stone of the South African economy.

### **Proposed area according to the MWP:**

This resource definition report produces for the project area indicates that there is potential 20 Mil tonnes of mineable Chrome Ore using open pit mining method. The study only focused on the open castable area within Portion 2. A further study will be required to quantify the reserves deeper than 80m which might be economically viable through, and underground mining method as done by neighbouring Samancor operation.

## **G. A MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT**

(-within the approved site as contemplated in the accepted scoping report;)

NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.

### **Location of the site**

This application was preceded by a prospecting right. The location of the site is preferred due to the presence of the mineral applied for.

As discussed in the previous section, based on outcomes of previous studies in the vicinity, mines in the surrounding area and the existing Prospecting Right on the proposed area, the possibility to encounter high volumes of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody near Mooinooi on Portion 2, Portion 155 & Portion 156 of the farm Elandskraal 469, Registration Division: JQ, North West province, were identified.

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102). Therefore, the applicant does not have an alternative location.

#### **Proposed area according to the MWP:**

This resource definition report produces for the project area indicates that there is potential 20 Mil tonnes of mineable Chrome Ore using open pit mining method. The study only focused on the open castable area within Portion 2. A further study will be required to quantify the reserves deeper than 80m which might be economically viable through and underground mining method as done by neighbouring Samancor operation.

#### **Preferred activity**

The mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody is the optimum preferred activity for the site. The mine will provide significantly more job opportunities than what is provided currently.

According to the Mine Work Programme ±58 employees will be employed.

Approximately 104ha of the application area is used for agricultural purposes. This may be an alternative activity, but the applicant will prefer to mine the proposed area due to the possibility high volumes of the mineral applied for.

### **H. A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT**

(-within the approved site as contemplated in the accepted scoping report, including:)

#### **i) Details of the development footprint alternatives considered;**

- **Consideration of alternatives**

The DEAT 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, site, activity, and technology alternatives. It is, however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer, the EAP and Interested and affected parties, which in some instances culminates in a single preferred project proposal. The following sections explore each type of alternative in relation to the proposed activity.

- **Location alternatives**

This alternative asks the question, if there is not, from an environmental perspective, a more suitable location for the proposed activity. No other properties have been secured by **Bila Civil Contractors (Pty) Ltd** near Mooinooi area to potentially mine Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody. Also, it is expected that the minerals have been deposited on this farm and therefore the applicant would like to commence with their mining activities.

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102). Therefore, the applicant does not have an alternative location.

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

*As was identified in the desktop PES as well as the baseline conditions established in this assessment the Marettwana River reach was found to be largely modified with the southern tributary in a seriously modified state. The proposed Elandskraal Chromium Mine extension is considered a source of modification within the catchment. The catchment is dominated by mining activity as a source of modification. The alternative where the mine extension does not occur will pose greater environmental rewards in the direct catchment. This decision however has the potential for greater*



- Highly susceptible to wind and water erosion;
- Flooding occurs frequently and is accompanied by crop damage;
- The subsoil has very low permeability;
- Wetness or waterlogged soil, even after draining;
- Limiting layers or shallow soils that cause restrictions in terms of root development and water storage;
- The soil has a low moisture-holding capacity;
- Inherently low fertility that cannot be easily corrected;
- Moderate salinity and sodicity may be present;
- Moderate climatic limitations.

- **Design and layout alternatives**

Design alternatives were considered throughout the planning and design phase (i.e. where the Minerals are located?). The layout follows the limitations of the site and aspects such as, roads, site offices, workshop area and exiting infrastructure constructed under the existing prospecting right.

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102).

According to the maps below (**Figure 28** and **Figure 29**), the proposed area is largely covered by cultivation, natural vegetation, degraded land and mining.

As mentioned above the applicant has an existing Prospecting Right on the proposed area and the area identified as natural vegetation on the land use and land cover maps below is currently disturbed by the mining activities, please see google earth map (**Figure 30**).

An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under Appendix 11. Please see the statement from the report below:

*“the majority of the current land use of the land should be adjusted to reflect MINING ACTIVITIES (old and new) on a major disturbed area of 188 ha. The rest of the application area covers an surface area (area 1 &2) that is used for AGRICULTURAL ACTIVITIES . The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural).*

A Water Use License Application (WULA) was submitted to DWS for the mining activities.

The location of the activities will be determined based on the location of the proposed opencast area as outlined in Figure 4.

- **No-go alternative**

This alternative considers the option of ‘do nothing’ and maintaining the status quo. The description provided in section H of this report could be considered the baseline conditions (status quo) to persist should the no-go alternative be preferred.

The area is currently used for agricultural activities and prospecting activities under an existing prospecting right. Approximately 104ha of the application area is used for agricultural purposes. In an event that the mining right activities will not be authorised, the farming activities will still continue as normal, and the prospecting activities will continue to operate until the right lapses and the right holder applies for closure.

- **Technology alternatives**

In terms of the technologies proposed, these have been chosen based on the long term success of their mining history. The mining activities proposed in the Mining Works Programme (**Appendix 9**) is dependent on the preceding phase as previously discussed, therefore no alternatives are indicated, but rather a phased approach of trusted mining techniques.

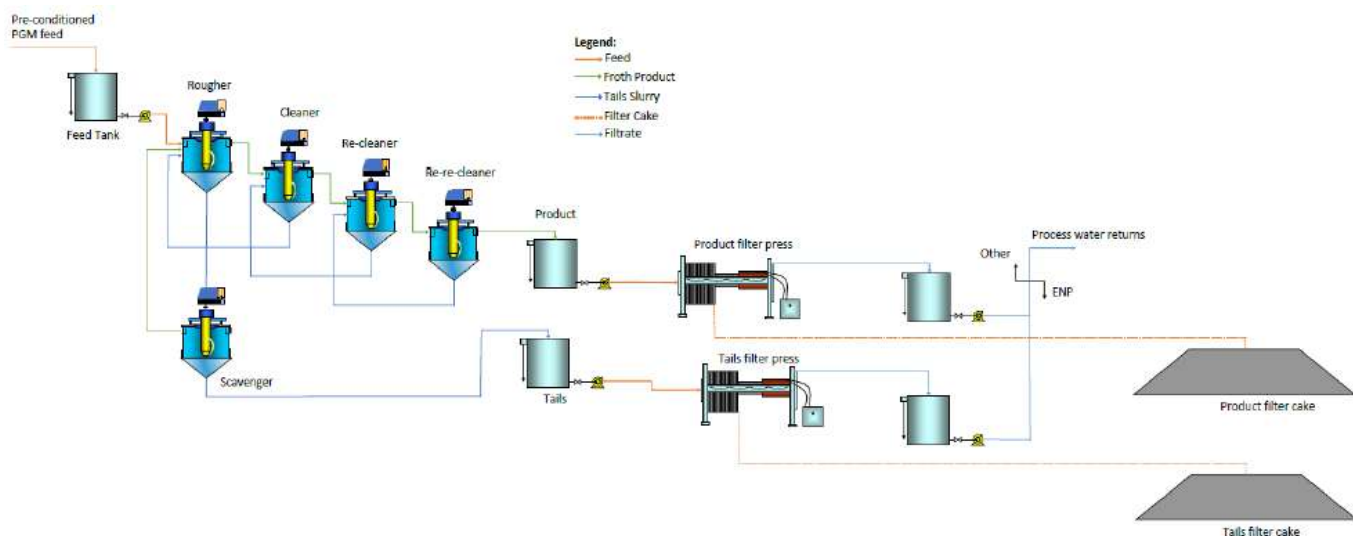
#### **Equipment and infrastructure according to the Mine Work Programme (MWP)**

- |  |                                      |
|--|--------------------------------------|
| ○ Processing Plants (Chrome plant & PGM plant) | ○ Explosive accessories Storage Area |
| ○ Stockpile                                    | ○ 6 X D155 Bulldozers                |
| ○ Temporary Tailings Storage pond              | ○ 24 X Hydraulic Excavators          |
| ○ Weighbridge                                  | ○ 32 X Dump trucks                   |
| ○ Sub-station                                  | ○ 4 X Front End Loaders              |





### Basic PGM Flotation plant Design



The processing plant will consist of the following systems:

- ROM Crushing and Screening system
- Milling
- DMS section
- Fines Treatment System
- Thickening
- Filtration
- Products and Discard Handling and Load-Out Systems
- Services (Water, Air, Flocculent and Magnetite)

The plant will be designed to treat 1.2 million tons per annum of ROM material. The ROM material at a top size of 300 mm will be received from on the mining operation. The ore will be crushed to -15 mm through a crushing and screening section. This material will then be fed to the washing plant for beneficiation. The material will be processed in the spiral plant to produce the products. The Coarse Tailings (-1 mm) will be removed and sold as construction aggregate material. The Fine Tailings (approximately – 200 microns) will be thickened and then sent to the PGM Processing Plant The discard material from the PGM plant will be moved to the tailings dump. The company is working on establishing a local market to sell the tailing material from the plant.

- a) Pre-crushing  
Oversize material is reduced to -300mm using an excavator mounted breaker
- b) Crushing plant  
Currently using a mobile crushing plant consisting of jaw crusher and cone crusher and screens. -30mm reduced to -15mm  
In the medium term this will be replaced by a static crushing plant.
- c) Feeding  
Material transported through feed bunker onto conveyor belts leading to wet screen
- d) Wet Screening  
6m x 2.4m wet screen with 0.8mm apertures screens material into the underpan
- e) Grinding  
Oversize material (+0.8mm -15mm) conveyed to ball mill or VSI crusher for further crushing and returned to wet screen on a closed circuit
- f) Spiral Plant Separation  
Slurry pumped from the screen underpan to top of spiral plant for spiral separation.
- g) Chemical and Metallurgical yield collected on the product pad to be sold to customers.
- h) Thickener  
Tailing slurry from the spiral plant is first put through a cyclone to extract the course tailings.  
Remaining slurry is directed to thickener to settle the fine tailings which are then deposited in the tailings pond. Fine tailings will be sold as PGM rich material.

### Summary of the PGM Wash Plant Processing:

The tailings stream received from chrome spiral plant is planned to contain approximately 2.5g/t PGM's at 16-20 t/h which will report to the filtration system for filtering and water recovery. Instead of selling the tails to the nearest PGM recovery plant, it is worthwhile to consider beneficiation of the PGM's on site.

Our initial flotation model estimates approximately 400 PGM ounces can be beneficiated per month at a concentrate grade of 100g/t 4E. At the current PGM basket price, this can be sold for around R13million per month. The project is still at conceptual stage at the moment and is to be further developed by our technical service providers. The final plant design and model are still under development.

**Dust suppression**

When it comes to dust suppression two main methods were considered, namely molasses stillage and the wetting (water) of roads. The table below provides a short summary of the advantages and disadvantages of each.

**Table 5: Dust Suppression**

Water	Molasses stillage
More cost effective	Much more expensive
Could lead to the depleting of water resources	Requires less water
No damage (only if used excessively)	The product may be toxic to aquatic organisms. (As this product could have physical effects on aquatic organisms for e.g. floating, osmotic damage)
No harm to humans or animals (Only a high quantity will have harm to humans or animals)	Not Hazardous or toxic. Could cause irritation to eyes, skin or when ingested and inhaled.
Non-flammable	Non-flammable
Eye-wash fountains not needed	Eye-wash fountains in the work place are strongly recommended
	Working procedures should be designed to minimize worker exposure to this product.
Basic storing methods	Storing methods are a bit more complicated. Should be stored in a plastic, plastic lined or stainless steel, tight closed containers between 5 and 40 degrees Centigrade.

Considering the above-mentioned information, water will be used for dust suppression purposes.

**ii) Details of the Public Participation Process Followed**

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.

**PUBLIC PARTICIPATION PROCESS**

**SCOPING PHASE**

**NEWSPAPER ADVERTISEMENT**

An advertisement was placed in English in the local newspaper, **Rustenburg Herald**, (see **Appendix 6**) notifying the public of the EIA process and requesting Interested and Affected Parties (I&APs) to register with, and submit their comments to Milnex CC. I&APs were given the opportunity to raise comments within 30 days of the advertisement.

**SITE NOTICES**

Site notices were placed on site in English to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs will be given the opportunity to raise comments. Photographic evidence of the site notices will be included in **Appendix 6**.



Figure 3: Site notices placement

**DIRECT NOTIFICATION AND CIRCULATION OF DRAFT SCOPING REPORT TO IDENTIFIED I&APS, SURROUNDING LANDOWNERS AND OCCUPIERS**

Identified I&APs, including key stakeholders representing various sectors, are directly informed of the proposed development and the availability of the draft Scoping Report via registered post on **28 September 2022** and were requested to submit comments by **28 October 2022**. A copy of the report is also available at the Milnex offices in Schweizer-Reneke, 4 Botha Street, Schweizer-Reneke and Potchefstroom (Waterberry Street, Waterberry Square, 1st floor, Office 5B, Potchefstroom), between 7:30AM and 5PM, Monday to Friday. For a complete list of stakeholder details and for proof of registered post see **Appendix 6**. The consultees included:

**Table 1: List of Stakeholders, Landowners, & surrounding landowners**

Landowners	
B H P Billiton SA Ltd South32 SA	Samancor Chrome Ltd
Pieter van Wyk	Bila Mining (Pty) Ltd
Catharina Maria Susanna Beumer	Kuhne Trust: Petrus Jacobus Buys
Willem Abraham Jacobus van Wyk	Kuhne Trust: Hendrik Rudolf du Plessis
Jan Martinus Beumer	Kuhne Trust: Jacobus Izak Olivier
Rachel Sophia Elizabeth Thomas	Kuhne Trust: Susanna Carolina Johanna van Wyk
Burns Street Prop Pty Ltd	Jacobus Johannes Fourie
L & H Boerdery Pty Ltd	Marjorie Frances Fourie
Surrounding Landowner	
Samancor Chrome Ltd	Schalk Willem David van Wyk
Green Mountain Traiding (Pty) Ltd	Sonja van Wyk
Maria Elizabeth Burger	Steve Monty Ferreira
Pieter Lodewikus van Wyk	Santambank Ltd
Barend Jacobus Gert Wessel van Wyk	Andries Stephanus Lourens van Wyk Trustees

South African National Roads Agency Ltd	Susara Cornelia Eiendomme CC
Delsipro Fifteen CC	Engela Wilhelmina Christina Welthagen
Topaz Flowers Nursery CC	Anna Elizabetha van Wyk
Petrus Johannes Landsberg	Stephanus Johannes Pretorius
Philippus Arnoldus Myburgh Walker	Louisa Aletta Minnaar
Pieter van Wyk	Franz Hermann Kuhne
Schalla van Schalkwyk Trust	Andries van der Walt
Department of Agriculture, Land Reform and Rural Development	Western Platinum Ltd
On behalf of the National Government of the Republic of South Africa	
BBB Properties (Pty) Ltd	Louisa Aletta Minnaar
Vastek Trading (Pty) Ltd	
<b>Stakeholders</b>	
Department of Economic Development, Environment, Conservation & Tourism (DEDECT)	
Department of Water & Sanitation (DWS)	
Department of Agriculture, Forestry & Fisheries (DAFF)	
Provincial Heritage Resources Agency (PHRA) North West	
Department of Public Works and Roads (DPWR)	
Department of Mineral Resources & Energy (DMRE)	
Department of Agriculture & Rural Development (DARD)	
Department of Environment, Forestry & Fisheries (DEFF)	
Department of Cooperative Governance and Traditional Affairs (DCGTA)	
Department of Human Settlements (DHS)	
Department of Community Safety and Transport Management (DCSTM)	
South African National Roads Agency SOC Ltd, (SANRAL)	
Bojanala Platinum District Municipality	
WESSA (National Office)	
Madibeng Local Municipality, Municipal Manager	
Madibeng Local Municipality, Ward 27 Councillor	

### MEETING DURING SCOPING PHASE

Please note that the Stakeholders & Interested and Affected Parties (I&APs) were informed about the proposed project with the use of press advertisement, registered letters and site notices.

A meeting was requested by one I&AP (Samancor), please see below:

#### **ZOOM MEETING WITH SAMANCOR**

Malan Scholes Attorneys requested a meeting on behalf of Samancor Chrome Limited after the final Scoping Report was submitted. The meeting was held via Zoom on 1 December 2022 at 14h00. Please find the complete minutes of the meeting under **Annexure 6(vi)**.

Below is part of the minutes of the meeting:

#### **1. Present**

Werner Broodryk (WB) – Milnex CC  
 Lizanne Esterhuizen (LE) – Milnex CC  
 Julian Combrinck (JC) – Milnex CC  
 Lia Bolz (LB) – Samancor Chrome (MalanScholes)

#### **2. Meeting**

Introduction were made by all the parties.  
 WB opened meeting and handed over to LE to attend to the environmental presentation.

### **2.1 Environmental presentation**

Please see the minutes of the meeting under Annexure 6(vi).

### **3. Questions/Comments**

The following question were asked by LB:

- 1) *To what extent is Milnex considering an 24G application for in terms of the illegal mining activities especially on portion 2?*
  - a. *WB: we are currently working on the specific application, which was submitted and accepted, so we cannot respond for now.*
  
- 2) *To what extent is Milnex considering the activities proposed relative to the underground mining that is taking place on portion 2?*
  - a. *LE: How deep is the underground works? LB: up to 40m.*
  - b. *WB: Is Samancor's right for chrome and for which seams? LB: does not know which seams, but the right is for chrome.*
  - c. *LB: the ultimate difficulty here for Samancor Chrome is that it holds a mining right for Chrome on portion 2, more specifically the remaining extent of portion 2. So there is ongoing litigation between Samancor and the applicant, around the historic illegal mining of the applicant on the property. The overlap is the problem, and from Samancor's perspective the application should never have been accepted. Samancor will deal with this through the proper process.*
  
- 3) *Will the applicant to the necessary studies to assess safety, for example the blasting on the surface which will impact underground workings?*
  - a. *WB: We will refer back to applicant and bring it to his attention, as one mine cannot pose safety risks to another mine and this will need to be investigated.*
  
- 4) *Other comments from Samancor, surrounding the final scoping, report will be submitted in writing.*
  
- 5) *LB requested the following:*
  - a. *The exact location of the processing plant.*
  - b. *A map that indicates the surface structures of the applicant.*
  - c. *The date of submission of the final scoping report.*
  - d. *The mining work program, as it is empty on Dropbox.*
  - e. *Presentation of the meeting.*

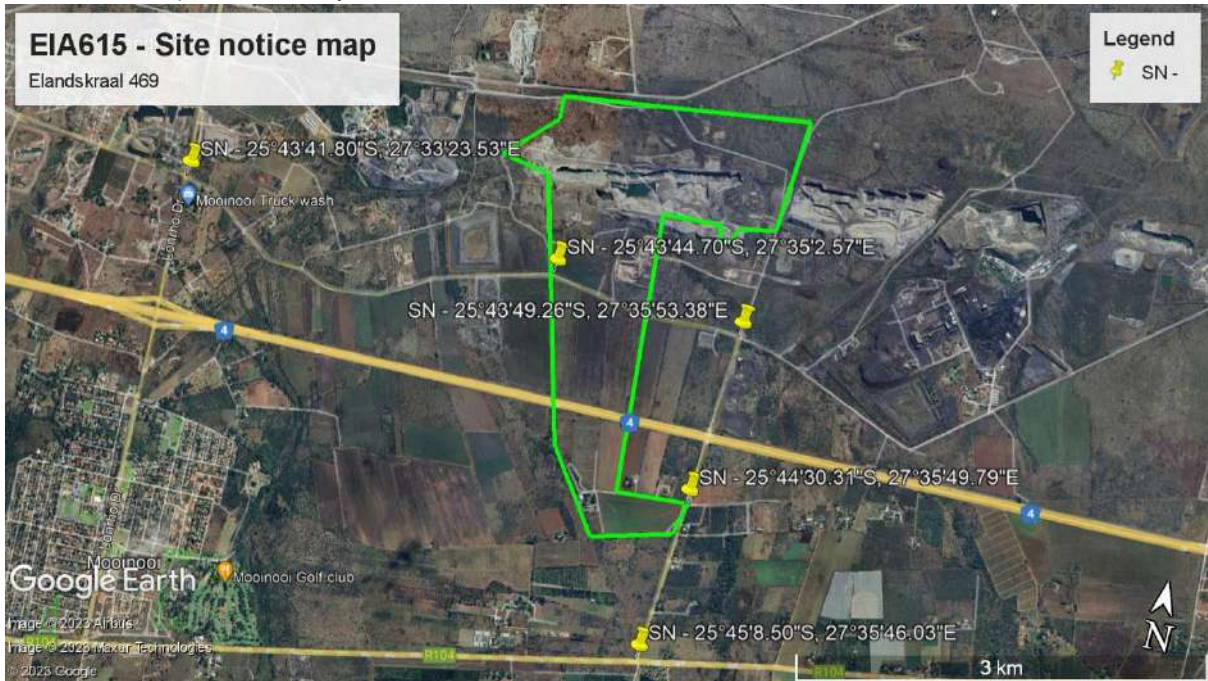
MEETING CLOSED AT 14h45.

**EIR PHASE**

**SITE NOTICES**

Site notices were placed on site in English to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs will be given the opportunity to raise comments. Photographic evidence of the site notices is be included in **Appendix 6**.

Site notices were placed on 04 July 2023.



**Figure 8:** EIR-phase site notices placement, 2nd

**DIRECT NOTIFICATION AND CIRCULATION OF DRAFT EIR & EMPR INCLUSIVE OF SPECIALIST STUDIES TO IDENTIFIED I&APS (STAKEHOLDER, LANDOWNERS, SURROUNDING LANDOWNERS, OCCUPIERS & I&APS)**

Identified I&APs, including key stakeholders representing various sectors, are directly informed of the proposed development and the availability of the draft EIR & EMPr via registered post or email on **06 July 2023** and were requested to submit comments by **07 August 2023** (30 days). Since the last day falls on a Saturday (5th of August 2023), the period is extended to Monday, 07 August 2023.

A copy of the report is also available at the Milnex offices in Schweizer-Reneke, 4 Botha Street, Schweizer-Reneke and Potchefstroom (Waterberry Street, Waterberry Square, 1st floor, Office 5B, Potchefstroom), between 7:30AM and 5PM, Monday to Friday. For a complete list of stakeholder details and for proof of registered post see **Appendix 6**.

**Table 2: List of Stakeholders, Landowners, & surrounding landowners**

Landowners	
B H P Billiton SA Ltd South32 SA	Burns Street Prop Pty Ltd
Willem Abraham Jacobus van Wyk	L & H Boerdery Pty Ltd
Rachel Sophia Elizabeth Thomas	Kuhne Trust: Petrus Jacobus Buys
Samancor Chrome Ltd	Kuhne Trust: Hendrik Rudolf du Plessis
Bila Mining (Pty) Ltd	Kuhne Trust: Jacobus Izak Olivier

Jan Martinus Beumer	Kuhne Trust: Susanna Carolina Johanna van Wyk
Pieter van Wyk	Jacobus Johannes Fourie
Catharina Maria Susanna Beumer	Marjorie Frances Fourie
<b>Surrounding Landowner</b>	
Samancor Chrome Ltd	Schalk Willem David van Wyk
Green Mountain Traiding (Pty) Ltd	Sonja van Wyk
Maria Elizabeth Burger	Steve Monty Ferreira
Pieter Lodewikus van Wyk	Santambank Ltd
Barend Jacobus Gert Wessel van Wyk	Andries Stephanus Lourens van Wyk Trustees
South African National Roads Agency Ltd	Susara Cornelia Eiendomme CC
Delsipro Fifteen CC	Engela Wilhelmina Christina Welthagen
Topaz Flowers Nursery CC	Anna Elizabetha van Wyk
Petrus Johannes Landsberg	Stephanus Johannes Pretorius
Philippus Arnoldus Myburgh Walker	Louisa Aletta Minnaar
Pieter van Wyk	Franz Hermann Kuhne
Schalla van Schalkwyk Trust	Andries van der Walt
Department of Agriculture, Land Reform and Rural Development	Western Platinum Ltd
On behalf of the National Government of the Republic of South Africa	
BBB Properties (Pty) Ltd	
Vastek Trading (Pty) Ltd	
<b>Stakeholders</b>	
Department of Economic Development, Environment, Conservation & Tourism (DEDECT)	
Department of Water & Sanitation (DWS)	
Department of Agriculture, Forestry & Fisheries (DAFF)	
Provincial Heritage Resources Agency (PHRA) North West	
Department of Public Works and Roads (DPWR)	
Department of Mineral Resources & Energy (DMRE)	
Department of Agriculture & Rural Development (DARD)	
Department of Environment, Forestry & Fisheries (DEFF)	
Department of Cooperative Governance and Traditional Affairs (DCGTA)	
Department of Human Settlements (DHS)	
Department of Community Safety and Transport Management (DCSTM)	
Bojanala Platinum District Municipality	
WESSA (National Office)	
Madibeng Local Municipality, Municipal Manager	
Madibeng Local Municipality, Ward 27 Councillor	
<b>Interested and Affected Party (I&amp;AP)</b>	
Petro Erasmus	



**TIMEFRAME EXTENSION**

Timeframe extension was requested under Section 3(7) of the NEMA: EIA Regulation of 2014 to submit the final EIR & EMP on 12<sup>th</sup> of June 2023, which was granted. Additional days were requested on the timeframe extension and granted until the 23<sup>rd</sup> of August 2023.

**ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES**

Comments received during this period are attached as comment & response report as well as populated in the table of summary of issues raised.

The comments received thus far is not populated in the draft EIR&EMPr. All comments received will be included in the final EIR&EMPr, which is to be submitted to the DMRE.



**iii) Summary of Issues Raised by I&As**  
**(Complete the table summarising comments and issues raised, and reaction to those responses)**

**Table: Summary of Issues Raised by I&As**

Interested And Affected Parties		Issues Raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issue and or response where incorporated
List The Names Of Persons Consulted In This Column, And Mark With An X Where Those Who Must Be Consulted Were In Fact Consulted.				
Organisation	Contact Person			
<b>LANDOWNER</b>				
<b>Elandskraal 2/469</b>	B H P Billiton SA Ltd			
	South32 SA			
	Willem Abraham Jacobus van Wyk			
	Rachel Sophia Elizabeth Thomas			
	Samancor Chrome Ltd			
	Bila Mining (Pty) Ltd			
	Jan Martinus Beumer			
	Pieter van Wyk			
	Catharina Maria Susanna Beumer			
	Burns Street Prop Pty Ltd			
	L & H Boerdery Pty Ltd			

<b>Elandskraal 155/469</b>	Kuhne Trust: Petrus Jacobus Buys			
	Kuhne Trust: Hendrik Rudolf du Plessis			
	Kuhne Trust: Jacobus Izak Olivier			
	Kuhne Trust: Susanna Carolina Johanna van Wyk			
<b>Elandskraal 156/469</b>	Jacobus Johannes Fourie			
	Marjorie Frances Fourie			
<b>SURROUNDING LANDOWNERS</b>				
<b>Elandskraal 87/469, 88/469, 1/469, 153/469, 154/469</b>	Samancor Chrome Ltd			
<b>Elandskraal 166/469</b>	Green Mountain Trading (Pty) Ltd			
<b>Elandskraal 165/469</b>	Maria Elizabeth Burger			
	Pieter Lodewikus van Wyk			
	Barend Jacobus Gert Wessel van Wyk			
<b>Elandskraal 231/469</b>	South African National Roads Agency Ltd			
<b>Elandskraal 185/469</b>	Delsipro Fifteen CC			
<b>Elandskraal 43/469</b>	Topaz Flowers Nursery CC			

	Petrus Johannes Landsberg			
	Philippus Arnoldus Myburgh Walker			
	Pieter van Wyk			
	Schalla van Schalkwyk Trust			
<b>Elandskraal 161/469 &amp; Turffontein RE/3/462</b>	Department of Agriculture, Land Reform and Rural Develoment  On behalf of the National Government of the Republic of South Africa			
<b>Elandskraal 160/469</b>	BBB Properties (Pty) Ltd			
<b>Elandskraal 159/469</b>	Vastek Trading (Pty) Ltd			
<b>Elandskraal 158/469</b>	Schalk Willem David van Wyk			
	Sonja van Wyk			
<b>Buffelsfontein 43/465</b>	Steve Monty Ferreira			
<b>Buffelsfontein RE/35/465</b>	Santambank Ltd			
	Andries Stephanus Lourens van Wyk Trustees			
	Susara Cornelia Eiendomme CC			
	Engela Wilhelmina Christina Welthagen			

	Anna Elizabetha van Wyk			
	Stephanus Johannes Pretorius			
	Louisa Aletta Minnaar			
	Franz Hermann Kuhne			
	Andries van der Walt			
<b>Middelkraal 52/466 &amp; 70/466</b>	Western Platinum Ltd			
<b>Elandskraal 234/469</b>	No information available on SearchWorks			
<b>Buffelsfontein 42/465</b>	Louisa Aletta Minnaar			
<b>THE MUNICIPALITY IN WHICH JURISDICTION THE DEVELOPMENT IS LOCATED</b>				
<b>Madibeng Local Municipality</b>	Municipal Manager: To whom it may concern			
<b>MUNICIPAL COUNCILOR OF THE WARD IN WHICH THE SITE IS LOCATED</b>				
<b>Madibeng Local Municipality</b>	Ward 27 Councillor			
<b>ORGANS OF STATE HAVING JURISDICTION</b>				
<b>Department of Economic Development, Environment, Conservation &amp; Tourism (DEDECT)</b>	Ouma Skosana			
<b>Department of Water &amp; Sanitation (DWS)</b>	Catsha Luyanda			
<b>Department of Agriculture, Forestry &amp; Fisheries (DAFF)</b>	Mr. Maurice Vukeya & Mrs Mpho Gumula			
<b>Provincial Heritage Resources Agency (PHRA) North West</b>	Mr. Motlhabane Mosiane			

<b>Department of Public Works and Roads (DPWR)</b>	Keoagile Sitase			
<b>Department of Mineral Resources &amp; Energy (DMRE)</b>				
<b>Department of Agriculture &amp; Rural Development (DARD)</b>	Head of Department			
<b>Department of Environment, Forestry &amp; Fisheries (DEFF)</b>	To whom it may concern			
<b>Department of Cooperative Governance and Traditional Affairs (DCGTA)</b>	Head of Department: Acting: Ms. M Lehoko			
<b>Department of Human Settlements (DHS)</b>	Head of Department: Acting: Mr Keatlegile James Mashigo			
<b>Department of Community Safety and Transport Management (DCSTM)</b>	Head of Department: Acting: Mr Molefi Morule			
<b>Office of the Regional Land Claims Commissioner: North West</b>	Kgomotso Majova			
<b>OTHER–</b>				
<b>Bojanala Platinum District Municipality</b>	Municipal Manager: To whom it may concern			
<b>WESSA (National Office)</b>	John Wesson			
<b>Interested and Affected Party</b>	Petro Erasmus			

iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

**BACKGROUND TO THE STUDY AREA AND MINING**

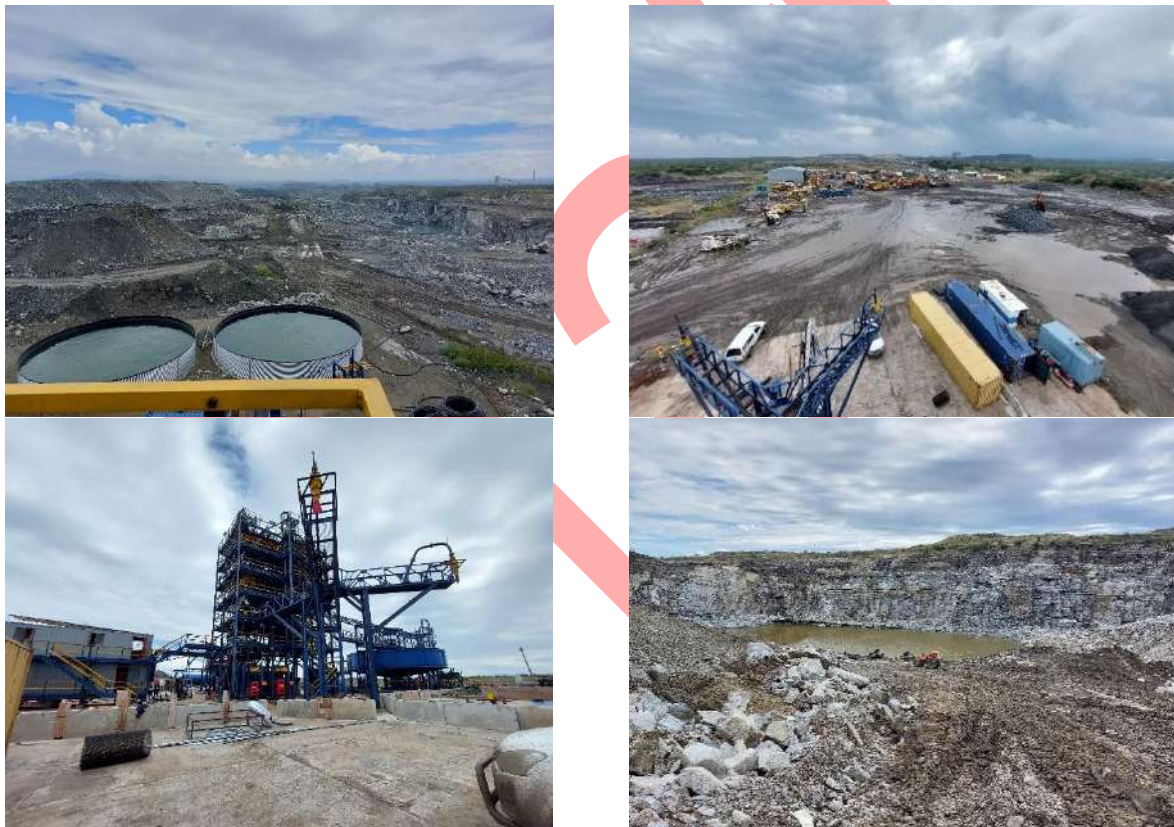
**Baseline Environment**

The baseline environment is described with specific reference to geotechnical conditions, ecological habitat and landscape features, Soil, land capability and agricultural potential, climate and the visual landscape.

There are active prospecting activities and agricultural activities on the application area.

According to the Terrestrial Biodiversity Impact Assessment (**Appendix 11**):

*“The area is heavily disturbed by current prospecting activities on the northern part of the application area. Over the northern part of the application area there are mining related infrastructure, such as a workshop area, fence lines, mine roads and access roads to the prospecting area, dumps of various sizes and purposes, quarries and excavations. The central and southern part of the project area is currently utilised as agricultural land with cultivated fields and citrus orchards.”*



**Figure 9:** Some of the Prospecting activities on site



**Figure 10:** Some of the more natural and agricultural areas of the proposed mining right area.

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

#### **Baseline Environment**

*The Maretswana River reach (A21K - 01028 SQR) associated with the Elandskraal Chromium Mine extension is considered seriously modified (D) at desktop level (PES). Through the assessment conducted, this was corroborated by the calculated PES for the system (class D for the Maretswana River reach and class E for the southern tributary). In-situ water quality indicated natural levels in the Maretswana River when compared to DWAF guidelines which indicate water quality would not be a hinderance to aquatic life. This requires further chemical analysis in ex-situ samples in order to investigate the concentrations of dissolved salts and metals associated with chromium mining as the macroinvertebrate assessment conflicted with natural water quality conditions. The March 2020 and June 2023 surveys indicated that habitat availability was varied throughout the assessed watercourses. The results of the SASS5 assessment classified the reach and associated tributary as largely to critically modified due to low presence of taxa comprised only of tolerant families during the 2020 survey. This points to physiochemical modification within the reach. The results of the June 2023 indicated the increase in the sampled macroinvertebrate communities in a downstream direction from M1 to M2. MIRAI indicated a class D/E (largely to seriously modified state) in March 2020 and C/D (moderately to largely modified) for the Maretswana River and class E or seriously modified state for the southern tributary, identifying water quality modification as the largest source of the absence of expected taxa. This improvement in the Maretswana River is likely due to improved habitat availability, water quality and flow diversity in 2023 as noted by the improved water quality driver response scores.*

*The available habitat within the Maretswana River reach was found to be largely modified in both the riparian and instream areas. The largest modifiers were to bed, flow and channel modification and degradation to water quality. The associated northern and southern tributaries were classed as having largely modified instream habitat and critical modified riparian habitat. The sources of modification the tributaries are the same as the Maretswana River reach, just more server with the largest contributor the mines which have developed through the watercourse. Riparian areas are identified as sensitive areas within the endangered Marikana Thornveld vegetation type which has constituted a 100m buffer.*

*A total of 15 fish species expected in the Maretswana River reach and associated tributaries with 8 species sampled which includes the vulnerable *O. mossambicus* and near threatened *Enteromius motebensis*. The catchment is a Fish Support Area for *E. motebensis* which was not sampled. As a whole the class of fish expected in the Maretswana River are moderately tolerant to changes in flow and and tolerant to physico-chemical modification. The FRAI indicates a largely modified natural fish community structure within the reach.*



#### 4.2 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features are summarised in Table 4-1.

Table 4-1 Summary of relevance of the proposed project to ecologically important landscape features.

Desktop Information Considered	Relevance	Section
Strategic Water Source Areas	Not applicable - The project area is not located within the SWSA for surface and ground water	4.2.1
Critical Biodiversity Area	Relevant – The project footprint overlaps with an ESA 1 and ESA 2 aquatic areas.	4.2.2
National Freshwater Ecosystem Priority Areas	Relevant: The project area is within a Fish Support Area, classified FEPA river designated to the assessed watercourse and catchment area.	4.2.3
National Wetland Map 5	Not Applicable– This database does not recognise the presence of wetlands within the extent of the project area.	4.2.4
Ecosystem Threat Status	Relevant - The project area is located along a Critically Endangered watercourse.	4.2.5
Ecosystem Protection Level	Relevant - The project area is located along a Not Protected watercourse.	4.2.6
Protected Areas	Relevant – The project area is within the Priority Focus Areas and conservation area	4.2.7

#### GROUNDWATER/ HYDROGEOLOGY

A Geohydrological investigations was undertaken by Afri GS 95 (Pty) Ltd, the report is available under **Appendix 11**. Please see the findings below:

*The study area is a mining field surrounded mostly by chrome wash plants and smelter plants which use large volumes of water on daily basis and some even in a 24/7 pumping cycle. However getting information on the volumes of groundwater used to run their plants, water levels etc was a challenge as most of the responsible individuals within the neighbouring sites were not forth coming with any information as they appeared sceptical about their water usage in their day to day running of their plants.*

##### 3.3.1. Borehole information

Two boreholes were located within the project area and both were sampled for macro-chemical analysis. Both boreholes are equipped with submersible pumps for the daily operations of the chrome washing plant. There is a semi-perennial stream that flows south westerly on the northern part of the project site. See Table 2 below for a summary of the hydrocensus results information pertaining to boreholes identified in the study area. The borehole positions can be found on the locality map in Figure 1 (BH 02 is located approx. 100m west of BH 01). The third borehole (BH 03) is located on the neighbouring property, Atvance chrome wash plant.

Table 2. Summary of borehole information from the hydrocensus

Borehole ID	South	East	Water level (mbgl)	Borehole depth (m)	Water use	Approximate abstraction (m <sup>3</sup> /day)
BH 01	25.722558	27.597543	18.12	88.68	Chrome washing	Unknown
BH 02	25.722603	27.596561	18.30	67	Chrome washing	Unknown
BH 03	25.739406	27.598087	N/A	Unknown	Chrome washing	Unknown

##### 3.7.2. Water quality results

Laboratory results for groundwater that was sampled at the project is as indicated in Table 7. Water samples were analysed at a SANAS Accredited laboratory and the Laboratory results are shown in Table 7

Laboratory results for groundwater that was sampled at the project is as indicated in Table 7. Water quality results suggest that groundwater at both boreholes is Class IV (Unacceptable quality) due to elevated Total hardness and Magnesium (BH 02 Class III).

Class 3	Poor water quality	<b>Drinking health:</b> Poses a risk of chronic health effects, especially in babies, children and the elderly .
		<b>Drinking aesthetic:</b> Bad taste and appearance may lead to rejection of the water.
		<b>Food preparation:</b> Poses a risk of chronic health effects, especially in children and elderly.
		<b>Bathing:</b> Significant effects on bathing or on bath fixtures
Class 4	Unacceptable water quality	<b>Laundry:</b> Significant effects on laundry or on fixtures.
		<b>Drinking health:</b> Severe acute health effects, even with short term use.
		<b>Drinking aesthetic:</b> Taste and appearance will lead to rejection of the water.
		<b>Food preparation:</b> Severe acute health effects, even with short term use.
		<b>Bathing:</b> Serious effects on bathing or on fixtures
		<b>Laundry:</b> Serious effects on laundry or on fixtures.

**3.7.3. Total Hardness - Remedial action**

The following processes are employed in the treatment of water hardness i.e. as recommended by the Department of Water and Sanitation:

- Base Exchange softening is used to replace the calcium and magnesium in the water with non-hardness forming sodium in ion exchange columns regenerated with a sodium chloride brine. This is a simple technique and can be operated successfully on a household scale.
- Demineralisation in mixed bed ion exchange columns may be used to remove all hardness-forming ions together with other ions in solution, where a particularly low salinity water is required.
- However, water is commonly softened by the addition of lime followed by re-carbonation or by using an ion exchange technique, sometimes preceded by a precipitation step if hardness in the feed water is particularly high.

It is recommended to treat groundwater from both boreholes before human consumption.

- (a) **Type of environment affected by the proposed activity.**  
(its current geographical, physical, biological, socio- economic, and cultural character).

**Results of the environmental sensitivity of the proposed area (Screening tool)**

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification.

**Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area**

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/1/1297	Solar PV	Approved	0.8
2	12/12/20/2145	Solar PV	Approved	17.3
3	12/12/20/2283	Solar PV	Approved	17.5

**Proposed Development Area Environmental Sensitivity**

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme			X	
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

**GEOLOGY AND SOILS**

The Elandskraal prospecting license area is situated in the Marikana Section of the western Bushveld Complex. The Marikana section is separated from the Brits section, to the east, by Wolhuterskop and the Rustenburg section, to the west, by the Spruitfontein upfold (Schurmann, et al., 1998). The Elandskraal prospecting license area is underlain by pyroxenites of the lower/transitional zone and lower critical zone in the southern and central portions of the license area. In the northern section of the prospecting area pyroxenites, norites and anorthosites of the lower to upper critical zone were observed. Two Chromitite layers are visible within the northern section of the license area. These two Chromitite layers are interpreted as forming part of the MG Chromitite Layer package. The MG Chromitite Layer package is subdivided into five groups of Chromitite layers, MG0, MG1, MG2, MG3 and MG4 with some of these layers being further subdivided into smaller units as well. The MG0 unit may be present but tends to be erratic and undefined. The MG1 layer is generally considered to be the most economically viable of the MG package however this can vary locally. Within the Marikana Section the entire MG and LG Chromitite packages are truncated by the UG 2 Chromitite layer in the west at the Spruitfontein upfold (Lomborg, et al., 2015). Figure 4.4c shows the general stratigraphy of the Bushveld Complex.

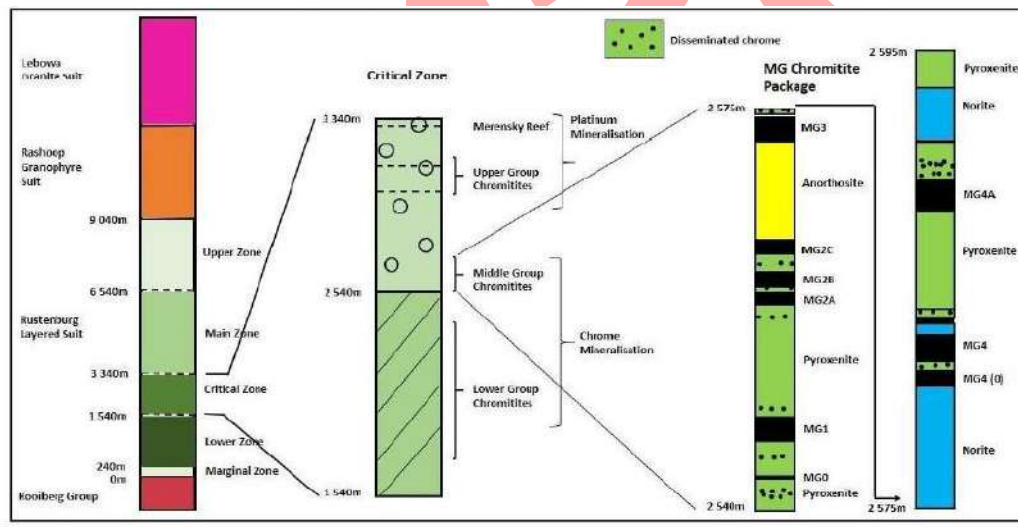


Figure 4.4c: Stratigraphy of the Bushveld Complex



A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

### **2.3 Vegetation**

South Africa has been recognized as having remarkable plant diversity with high levels of endemism. South Africa hosts a wide range of ecosystems, including nine biomes, namely the Fynbos, Succulent Karoo, Desert, Nama-Karoo, Grassland, Savanna, Albany Thicket, Indian Ocean Coastal Belt and Forest Biomes (Mucina & Rutherford, 2006). The project area is situated in the Savanna biome (Mucina & Rutherford, 2006), which is characterised by a grassy ground layer and a distinct tree layer. The Savanna biome is an important biome throughout Africa and is also found in other continents including South-America, Australia and India (Mucina & Rutherford, 2006).

The three environmental factors playing the most important role in the vegetation composition are (1) low precipitation, which prevent the upper layer from dominating, (2) fires and (3) grazing, which keeps the grass layer dominant (Low & Rebelo, 1996). The Savanna biome is mostly used for grazing, but where the soil is deeper, crop production and the cultivation of subtropical fruit is practiced.

The Savanna biome in South Africa is generally better conserved than most of the other biomes, mainly due to the presence of the Kruger National Park and the Kgalagadi Transfrontier National Park, within this biome (Low & Rebelo, 1996). Conservation areas in the North-West Province include, amongst others, the Borakalalo Nature Reserve, Pilanesberg National Park, Madikwe Game Reserve and Magaliesberg Nature Reserve, which cover a surface area of 193 500 ha (Mucina et al., 2005).

Most of the study area falls into the **Marikana Thornveld** vegetation unit and a small portion in the south in the **Moot Plains Bushveld** (Mucina et al., 2005) (Figure 2).

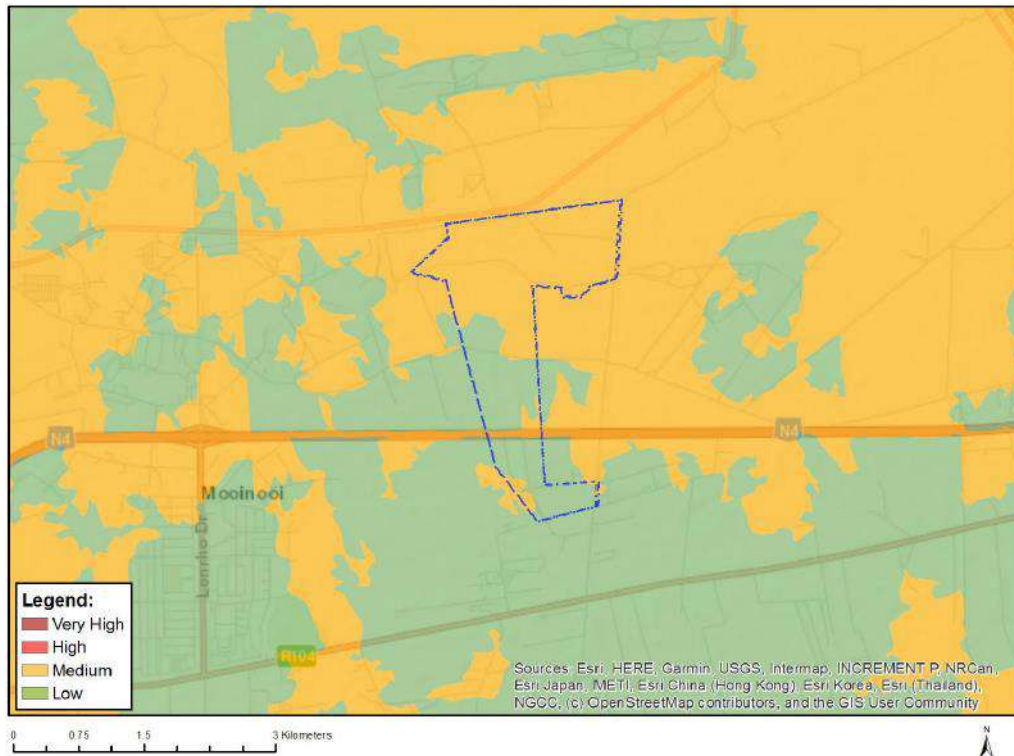
Mucina and Rutherford (2006) describe the Marikana Thornveld vegetation unit as open *Vachellia* karroo woodland, occurring in valleys and slightly undulating plains and some lowland hills. Shrubs are more dense along drainage lines, on termitaria and rocky outcrops or other habitat protected from fire.

The **conservation status** of this vegetation unit is **endangered**.

The Moot plains bushveld is open to closed, low, often thorny savanna dominated by various species of *Vachellia*. The herbaceous layer is dominated by grasses (Mucina and Rutherford, 2006).

The **conservation status** of this vegetation unit is **vulnerable**.

According to the DFFE Screening Report the Relative Plant Species Theme Sensitivity is Medium and Low. Please see **Appendix 7** for the colour map.



**Figure 13:** Plant species combined sensitivity

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

### 3.1 Flora survey

A desktop study was completed to find out into which vegetation unit, according to Mucina and Rutherford (2006), the project area falls. It was further determined whether the project area is in a Critical Biodiversity Area (CBA) or in an Ecological Support Area (ESA) and whether there are any National Freshwater Ecosystem Priority Areas (NFEPAs) nearby. Vegetation units were identified on aerial photographs. A field survey was completed on 12 March 2021, during which vegetation units were surveyed. A list of plant species was compiled for each unit and other environmental factors (such as soil type and land use) were noted. A search for any Species of Conservation Concern (SCC) was also conducted as listed in the EIA screening tool or other databases for the Quarter Degree Grid that lists potential species.

### 3.2 Fauna survey

A desktop survey was completed to determine which fauna species of conservation concern may be found in the area, according to their distribution range. Habitat types were identified during the field surveys and described.

A search for any Species of Conservation Concern (SCC) was also conducted as listed in the EIA screening tool or other databases for the Quarter Degree Grid that lists potential species.

### 4.1 Vegetation

A vegetation survey was completed in the project area. Five different vegetation units were identified (Figure 9).

#### 4.1.1 Encroached *Dichrostachys cinerea* – *Heteropogon contortus* thornveld

This vegetation unit is located north of the prospecting area, on vertic black clay soils. The landscape is a flat plain. The area is currently vacant, but was used for livestock grazing in the past. The overgrazing of the area in the past caused the area to become encroached by *Dichrostachys cinerea* and *Vachellia tortilis*. Dominant plant species include the trees *Dichrostachys cinerea* and *Vachellia tortilis* and the grasses *Heteropogon contortus*, *Urochloa mosambicensis* and *Eragrostis lehmanniana*.

No protected tree species, species of conservation concern or endemic species were recorded in this vegetation unit.

A total of 41 plant species were recorded in this vegetation unit. The species are listed in Table 2 below, with an indication of whether they are exotic or not, their red list category and whether they are endemic (SANBI, 2012). A short explanation of the terms used in the table is given below.

- Least Concern (LC): Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
- Not evaluated: Exotic species are not evaluated by the SANBI red list for plants.

Table 2: Trees and shrubs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Asparagus suaveolens</i>	Wild asparagus	No	LC	No
<i>Asparagus laricinus</i>	Wild asparagus	No	LC	No
<i>Dichrostachys cinerea</i>	Sickle bush	No	LC	No
<i>Dombeya rotundifolia</i> var. <i>rotundifolia</i>	Common wild pear	No	LC	No
<i>Ehretia rigida</i>	Puzzle bush	No	LC	Yes
<i>Euphorbia ingens</i>	Common tree Euphorbia, naboom	No	LC	No
<i>Grewia flava</i>	Raisin bush	No	LC	No
<i>Grewia flavescens</i>	Sandpaper raisin	No	LC	No
<i>Obetia tenax</i>	Rock tree-nettle	No	LC	No
<i>Ochna pretoriensis</i>	Magalies redwood	No	LC	No
<i>Opuntia ficus-indica</i>	Prickly Pear	Yes	Not evaluated	No
<i>Searsia lancea</i>	Karree	No	LC	No
<i>Senegalia caffra</i>	Common hook-thorn	No	LC	No
<i>Senna bicapsularis</i>	Rambling senna	Yes	Not evaluated	No
<i>Vachellia gerrardii</i>	Red thorn	No	LC	No
<i>Vachellia nilotica</i>	Scented thorn	No	LC	No
<i>Vachellia tortilis</i> subsp. <i>heteracantha</i>	Umbrella thorn	No	LC	No
<i>Viscum rotundifolium</i>	Red Berry Mistletoe	No	LC	No
<i>Ziziphus mucronata</i>	Buffalo-thorn	No	LC	No

Table 3: Grasses and sedges

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Aristida congesta</i>	Spreading Three-awn	No	LC	No
<i>Aristida junciformis</i>	Gongoni three-awn	No	LC	No
<i>Bothriochloa insculpta</i>	Turf grass	No	LC	No
<i>Cenchrus ciliaris</i>	Foxtail buffalo grass	No	LC	No
<i>Chloris virgata</i>	Feather-top chloris	No	LC	No
<i>Cynodon dactylon</i>	Couch Grass	No	LC	No
<i>Cyperus obtusiflorus</i>	Blunt-flowered Sedge	No	LC	No
<i>Enneapogon scoparius</i>	Bottlebrush grass	No	LC	No
<i>Eragrostis lehmanniana</i>	Lehmann's Love Grass	No	LC	No
<i>Eragrostis nindensis</i>	Wether love grass	No	LC	No
<i>Eragrostis trichophora</i>	Hairy love grass	No	LC	No
<i>Eragrostis superba</i>	Saw-tooth love grass	No	LC	No
<i>Heteropogon contortus</i>	Spear grass	No	LC	No
<i>Melinis repens</i>	Natal red top	No	LC	No
<i>Panicum maximum</i>	Guinea grass	No	LC	No
<i>Themeda triandra</i>	Red grass	No	LC	No
<i>Tragus berteronianus</i>	Spiked Carrot-seed Grass	No	LC	No
<i>Urochloa mosambicensis</i>	Bushveld signal grass	No	LC	No

Table 4: Forbs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Achyranthes aspera</i>	Chaff flower	Yes	Not evaluated	No
<i>Aloe maculata</i>	Common soap Aloe, Bontaalwyn	No	LC	No
<i>Alternanthera pungens</i>	Khaki Burrweed	Yes	Not evaluated	No
<i>Amaranthus hybridis</i>	Pigweed	Yes	Not evaluated	No
<i>Bidens bipinnata</i>	Spanish blackjack	Yes	Not evaluated	No
<i>Chamaecrista comosa</i>		No	LC	No
<i>Chenopodium album</i>	White goosefoot	Yes	Not evaluated	No
<i>Commelina benghalensis</i>	Wandering Jew	No	LC	No
<i>Crassula spp.</i>				
<i>Crinum macowanii</i>	Common Vlei Crinum	No	LC	No
<i>Datura stramonium</i>	Thorn apple	Yes	Not evaluated	No
<i>Euphorbia heterophylla</i>	Wild Poinsettia	Yes	Not evaluated	No
<i>Herbsttaedtia fleckii</i>	Cat's Tail	No	LC	No
<i>Indigofera daleoides</i>		No	LC	No
<i>Indigofera melanadenia</i>		No	LC	No
<i>Indigofera nebrowiana</i>		No	LC	No
<i>Jasminum multipartitum</i>	Wild Jasmine	No	LC	No
<i>Kalanchoe sexangularis</i>	Bushveld kalanchoe	No	LC	No
<i>Kyllinga alba</i>	Witbiesie	No	LC	No
<i>Lantana camara</i>	Common lantana	Yes	Not evaluated	No
<i>Lantana rugosa</i>	Bird's Brandy	No	LC	No
<i>Ledebouria revoluta</i>	Incubudwana (z)	No	LC	No
<i>Lippia javanica</i>	Lemon bush, fever tea	No	LC	No
<i>Lippia rehmannii</i>	Rehmann-lippia	No	LC	No
<i>Monsonia angustifolia</i>	Crane's Bill	No	LC	No
<i>Nidorella anomala</i>	Mokoteli	No	LC	No
<i>Ornithogalum spp.</i>				
<i>Pearsonia grandifolia</i>		No	LC	No
<i>Pentarrhinum insipidum</i>	African Heartvine	No	LC	No
<i>Portulaca kermesina</i>	Haaskos	No	LC	No
<i>Rhynchosia minima</i>		No	LC	No
<i>Rhynchosia monophylla</i>		No	LC	No
<i>Schkuria pinnata</i>	Dwarf Mexican Marigold	Yes	Not evaluated	No
<i>Senecio barbertonicus</i>	Succulent bush senecio	No	LC	No
<i>Sesbania bispinosa</i>		Yes	Not evaluated	No
<i>Solanum panduriforme</i>	Poison apple	No	LC	No
<i>Solanum supinum</i>	Bitter apple	No	LC	No
<i>Sphedamnocarpus pruriens</i>		No	LC	No
<i>Syncolostemon pretoriae</i>		No	LC	No
<i>Tagetes minuta</i>	Tall khaki weed	Yes	Not evaluated	No
<i>Tribulus terrestris</i>	Devil's Thorn	No	LC	No
<i>Zinnia peruviana</i>	Wild Zinnia	Yes	Not evaluated	No

Thirteen out of the 79 recorded species (16 %) are exotic species. No endemic species were recorded. The red list status of all other species is Least Concern (or Not Evaluated in the case of exotic species).

#### 4.1.2 *Vachellia nilotica* – *Vachellia tenuispina* open thornveld

This vegetation unit is natural veld located north-east of the prospecting area, on clay soils. The state of the vegetation can be described as in a near-natural state.

Dominant plant species include the trees *Vachellia nilotica* and *Searsia leptodictya* and the grass *Setaria incrassata*.

No protected tree species were recorded. One species of conservation concern was recorded in this vegetation unit, namely *Merwillia plumbea* (Blue squill) which is **Near Threatened**.



A total of 37 plant species were recorded in this vegetation unit. They are listed in the tables below, with an indication of whether they are exotic or not, their red list category and whether they are endemic (SANBI, 2012). A short explanation of the terms used in the table is given below.

- **Least Concern (LC):** Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
- **Near Threatened (NT):** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
- **Not evaluated:** Exotic species are not evaluated by the SANBI red list for plants.

Table 5: Trees and shrubs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Asparagus suaveolens</i>	Wild asparagus	No	LC	No
<i>Asparagus laricinus</i>	Wild asparagus	No	LC	No
<i>Dichrostachys cinerea</i>	Sickle bush	No	LC	No
<i>Euclea crispa</i> subsp. <i>crispa</i>	Blue Guarri	No	LC	No
<i>Searsia lancea</i>	Karree	No	LC	No
<i>Searsia leptodictya</i>	Rock Karree	No	LC	No
<i>Searsia pyroides</i>	Common wild currant	No	LC	No
<i>Vachellia nilotica</i>	Scented thorn	No	LC	No
<i>Vachellia tenuispina</i>	Turf thorn	No	LC	No

Table 6: Grasses

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Aristida stipitata</i>	Long-awned grass	No	LC	No
<i>Bothriochloa insculpta</i>	Turf grass	No	LC	No
<i>Brachiaria eruciformis</i>	Sweet signal grass	No	LC	No
<i>Heteropogon contortus</i>	Spear grass	No	LC	No
<i>Ischaemum fasciculatum</i>	Hippo grass	No	LC	No
<i>Setaria incrassata</i>	Vlei bristle grass	No	LC	No
<i>Sorghum versicolor</i>	Black-seed sorghum	No	LC	No
<i>Themeda triandra</i>	Red grass	No	LC	No

Table 7: Forbs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Aloe maculata</i>	Common soap Aloe, Bontaalwyn	No	LC	No
<i>Chamaecrista comosa</i>		No	LC	No
<i>Corchurus asplenifolius</i>	Gusha	No	LC	No
<i>Cordylostigma virgatum</i>		No	LC	No
<i>Crabbea angustifolia</i>		No	LC	Yes
<i>Eucomis autumnalis</i>	Pineapple Lily	No	LC	No
<i>Gladiolus dalenii</i>	African gladiolus	No	LC	No
<i>Hilliardiella oligocephala</i>	Bicoloured-leaved vernonia	No	LC	No
<i>Ipomoea transvaalensis</i>		No	LC	No
<i>Ledebouria revoluta</i>	Incubudwana (z)	No	LC	No
<i>Merwillia plumbea</i>	Blue Squill	No	NT	No
<i>Nidorella anomala</i>	Mokoteli	No	LC	No
<i>Polygala hottentotta</i>	Small purple broom	No	LC	No
<i>Rhynchosia minima</i>		No	LC	No
<i>Sida dregei</i>	Spider-leg	No	LC	No
<i>Solanum panduriforme</i>	Poison apple	No	LC	No
<i>Striga elegans</i>	Large Mealie-witchweed	No	LC	No
<i>Striga forbesii</i>	Giant Mealie Witchweed	No	LC	No
<i>Striga gesnerioides</i>	Purple Witchweed	No	LC	No
<i>Tephrosia capensis</i>		No	LC	No

No exotic species were recorded. One endemic species was recorded.

#### 4.1.3 *Vachellia nilotica* – *Searsia lancea* mixed thornveld

This vegetation unit is natural veld located south of the wetland and drainage channel that bisect the project area. The vegetation unit was identified as a variation of the *Vachellia nilotica* – *Vachellia tenuispina* open thornveld.

Dominant plant species include the trees *Vachellia nilotica* and *Searsia lancea* and the grass *Setaria incrassata*.

No protected tree species or species of conservation concern was recorded. One endemic species was recorded in this vegetation unit.

A total of 41 plant species were recorded in this vegetation unit. They are listed in the tables below, with an indication of whether they are exotic or not, their red list category and whether they are endemic (SANBI, 2012).

Table 8: Trees and shrubs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Asparagus suaveolens</i>	Wild asparagus	No	LC	No
<i>Asparagus larinus</i>	Wild asparagus	No	LC	No
<i>Combretum hereroense</i>	Russet bushwillow	No	LC	No
<i>Dichrostachys cinerea</i>	Sickle bush	No	LC	No
<i>Euclea crispa</i> subsp. <i>crispa</i>	Blue Guarri	No	LC	No
<i>Searsia lancea</i>	Karree	No	LC	No
<i>Searsia leptodictya</i>	Rock Karee	No	LC	No
<i>Searsia pyroides</i>	Common wild currant	No	LC	No
<i>Senegalia caffra</i>	Common hook-thorn	No	LC	No
<i>Vachellia nilotica</i>	Scented thorn	No	LC	No
<i>Vachellia tenuispina</i>	Turf thorn	No	LC	No

Table 9: Grasses

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Aristida stipitata</i>	Long-awned grass	No	LC	No
<i>Bothriochloa insculpta</i>	Turf grass	No	LC	No
<i>Brachiaria eruciformis</i>	Sweet signal grass	No	LC	No
<i>Eragrostis bicolor</i>	Vlei Love Grass	No	LC	No
<i>Heteropogon contortus</i>	Spear grass	No	LC	No
<i>Ischaemum fasciculatum</i>	Hippo grass	No	LC	No
<i>Setaria incrassata</i>	Vlei bristle grass	No	LC	No
<i>Sorghum versicolor</i>	Black-seed sorghum	No	LC	No
<i>Themeda triandra</i>	Red grass	No	LC	No

Table 10: Forbs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Aloe maculata</i>	Common soap Aloe, Bontaalwyn	No	LC	No
<i>Chamaecrista comosa</i>		No	LC	No
<i>Corchurus asplenifolius</i>	Gusha	No	LC	No
<i>Cordylostigma virgatum</i>		No	LC	No
<i>Crabbea angustifolia</i>		No	LC	Yes
<i>Eucomis autumnalis</i>	Pineapple Lily	No	LC	No
<i>Gladiolus dalenii</i>	African gladiolus	No	LC	No
<i>Hibiscus trionum</i>	Bladder weed	Yes	Not evaluated	No
<i>Hilliardiella oligocephala</i>	Bicoloured-leaved vernonia	No	LC	No
<i>Ipomoea transvaalensis</i>		No	LC	No
<i>Ledebouria revoluta</i>	Incubudwana (z)	No	LC	No
<i>Nidorella anomala</i>	Mokoteli	No	LC	No
<i>Polygala hottentotta</i>	Small purple broom	No	LC	No
<i>Rhynchosia minima</i>		No	LC	No
<i>Sida dregei</i>	Spider-leg	No	LC	No
<i>Solanum panduriforme</i>	Poison apple	No	LC	No
<i>Striga elegans</i>	Large Mealie-witchweed	No	LC	No
<i>Striga forbesii</i>	Giant Mealie Witchweed	No	LC	No
<i>Tephrosia capensis</i>		No	LC	No
<i>Tithonia rotundifolia</i>	Red Sunflower	Yes	Not evaluated	No
<i>Xanthium strumarium</i>	Large cocklebur	Yes	Not evaluated	No

Three of the 41 recorded species are exotics (7%). One endemic species was recorded. The red list status of all recorded species is Least Concern.

#### 4.1.4 *Vachellia tenuispina* – *Searsia lancea* mixed thornveld

This vegetation unit is associated with topsoil stockpiles in the project area. The vegetation is in a secondary state of succession although the species diversity is lower compared to the surrounding natural thornveld. Mature trees were documented on the stockpiles indicating the secondary state of succession.

Dominant plant species include the trees *Vachellia tenuispina* and *Searsia lancea* and the grass *Fingerhuthia africana*.

No protected tree species or species of conservation concern was recorded. No endemic species were recorded in this vegetation unit.

A total of 20 plant species were recorded in this vegetation unit. They are listed in the tables below, with an indication of whether they are exotic or not, their red list category and whether they are endemic (SANBI, 2012). A short explanation of the terms used in the table is given below.

Table 11: Trees and shrubs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Searsia lancea</i>	Karree	No	LC	No
<i>Searsia leptodictya</i>	Rock Karree	No	LC	No
<i>Vachellia tenuispina</i>	Turf thorn	No	LC	No

Table 12: Grasses

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Aristida stipitata</i>	Long-awned grass	No	LC	No
<i>Cynodon dactylon</i>	Couch Grass	No	LC	No
<i>Enneapogon cenchroides</i>	Nine-awned grass	No	LC	No
<i>Fingerhuthia africana</i>	Thimble grass	No	LC	No
<i>Heteropogon contortus</i>	Spear grass	No	LC	No
<i>Melinis repens</i>	Natal red top	No	LC	No
<i>Setaria incrassata</i>	Vlei bristle grass	No	LC	No

Table 13: Forbs

Scientific name	Common name	Exotic	Red list category	Endemic
<i>Bidens bipinnata</i>	Spanish blackjack	Yes	Not evaluated	No
<i>Corchurus asplenifolius</i>	Gusha	No	LC	No
<i>Cordylostigma virgatum</i>		No	LC	No
<i>Euphorbia inaequilatera</i>	Smooth creeping milkweed	No	LC	No
<i>Gladiolus dalenii</i>	African gladiolus	No	LC	No
<i>Gomphocarpus fruticosus</i>	Milkweed	No	LC	No
<i>Lantana rugosa</i>	Bird's Brandy	No	LC	No
<i>Pentarrhinum insipidum</i>	African Heartvine	No	LC	No
<i>Rhynchosia minima</i>		No	LC	No
<i>Schkuria pinnata</i>	Dwarf Mexican Marigold	Yes	Not evaluated	No

Two of the 20 recorded species are exotics (10%). No endemic species were recorded. The red list status of all recorded species is Least Concern (or Not Evaluated for exotic species).

#### 4.1.5 Phragmites australis wetland

The state of the wetland to the south of the prospecting activities is considered very disturbed due to the prospecting activities that occurs to the west and north of the wetland. An in-depth survey of the wetland was not conducted as access was a limitation during the survey. The dominant species is *Phragmites australis*.

#### 4.1.6 Mined areas

The areas that were already mined or prospected in the past are very disturbed and in many cases completely destroyed and the vegetation was therefore not surveyed.

#### 4.1.7 Cultivated fields

The cultivated fields were also not surveyed, due to the fact that very little natural vegetation remains.

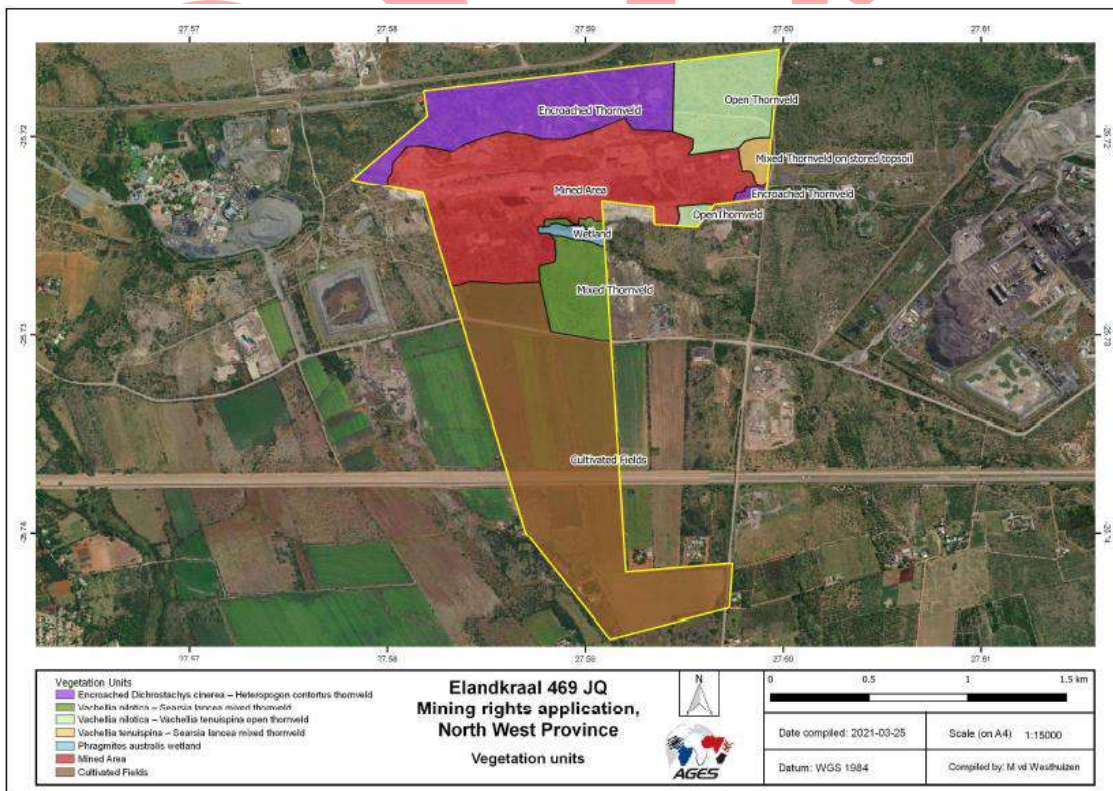


Figure 9: Vegetation units

#### 4.1.8 Declared invaders

The following declared invaders were recorded in the project area and they should be controlled: Table 14: Declared invader plant species recorded in the project area (NEMBA, 2016)

Scientific name	Common name	Invader category
<i>Datura stramonium</i>	Thorn apple	1b
<i>Lantana camara</i>	Common lantana	1b
<i>Opuntia ficus-indica</i>	Sweet prickly pear, boereturksvy	1b
<i>Senna bicapsularis</i>	Rambling senna	1b
<i>Tithonia rotundifolia</i>	Red Sunflower	1b
<i>Xanthium strumarium</i>	Large cocklebur	1b

**Category 1** plants are prohibited plants which must be controlled or eradicated. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment.

- Category 1a: Plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned
- Category 1b: Plants are widespread invasive species controlled by a management program.

**Category 2** plants are invaders with certain useful qualities, such as commercial use or for woodlots, animal fodder, soil stabilisation, etc. These plants are allowed in demarcated areas under controlled conditions and in biocontrol reserves.

**Category 3** plants are alien plants that are currently growing in, or have escaped from areas such as gardens, but that are proven invaders. No further planting is allowed (except with special permission), nor trade in propagative material. Existing plant may remain but must be prevented from spreading. Plants within the flood line and watercourses must be removed (Bromilow, 2010).

#### 4.1.9 Protected plants

None of the specially protected plant species listed in the North West Biodiversity Management Act (Provincial Notice 3 of 2017) were recorded.

#### 4.1.10 Protected trees

No protected trees were recorded.

#### 4.1.11 EIA screening tool listed species (SCC)

The screening tool listed one vulnerable plant species and one vulnerable animal species. Non of these were recorded and it is unlikely that they will be present in the project area, as they are sensitive to disturbance and the area is disturbed.

### LAND CAPABILITY / AGRICULTURAL

According to an article on the Grain SA website by Garry Paterson from ARC-Institute for Soil, Climate and Water on the Grain SA website, agriculture rests on three pillars where natural resources are concerned. These are the soil (comprising the growth medium for the plant), the climate conditions (which supply the plant with sufficient water and heat) and the terrain (enabling the crop to be physically planted, to grow and to be harvested sustainably).

The concept of land capability combines the three natural resource elements or factors listed above (soil, climate and terrain) and uses set parameters to determine a specific class for a given area. The basis of the land capability assessment in South Africa is the well-known Land Type Survey, which is a country-wide inventory of natural resources, i.e. soil pattern, macroclimate and terrain type, carried out between 1972 and 2002 by the ARC-Institute for Soil, Climate and Water.

Each unique land type is allocated to one of eight land capability classes. These classes are based on the original USDA land capability system, whereby Classes I and II comprise areas with little or no limitations to rainfed agriculture, Classes III and IV comprise those areas which are still considered arable, but with moderate to severe restrictions. Classes V to VIII comprise non-arable land with increasingly serious restrictions, either in terms of restricted soil, steep terrain, rockiness and/or an unfavourable climatic regime. (Garry Paterson, ARC-Institute for Soil, Climate and Water, November 2014.)



An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under **Appendix 11**. Please see the findings below:

*Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration identified by the national web based environmental screening tool (screening tool), where determined, must be confirmed by undertaking a site sensitivity verification.*

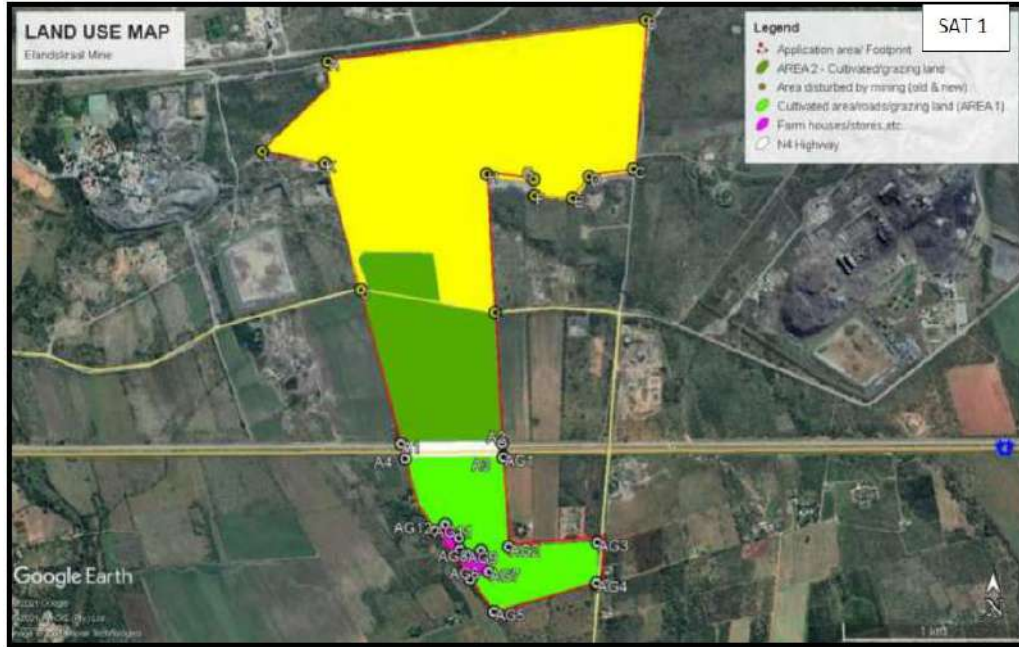



TABLE 2.1: SITE SENSITIVITY VERIFICATION

See Legend (Map) for location	LANDUSE	Surface area (ha)	STATUS	Comment	Environmental Sensitivity	Environmental impact
1	Area disturbed by mining (current and old activities)  See Sat image 1 & 2 and site inspection photo's.	188 ha	Majority of the surface area is (incl. soil cover) disturbed by mining activities such as , opencast voids, waste rock dumps dumped on top of topsoil, gravel access roads, ore stockpiles , topsoil dumps, berms, rehabilitated waste rock dumps, etc. Vegetation cover totally disturbed by mining activities. Shallow soils and rock outcrops found in this area.	This is an active mining site. Samancor , etc., also mined in this area. Rehabilitated waste rock dumps area being found on site.  	Low	Environmental impact by current mining activities are high for soil, vegetation , etc.
2	Area 1: Cultivated area/ farm roads / grazing land	41,6 ha	See SAT image 1 & 2  The majority of the area ( soil covered area) is being utilized for grazing (cultivated and natural). The original vegetation cover has been totally replaced.	Prior to opencast mining starts , all the topsoil (Vertisol =Arcadia form) should be removed and stockpile for future replacement during rehabilitation phase.  This will allow the specific area to be returned to a agricultural area for future use with a grazing capability/potential in the future.	Medium	Environmental impact by future mining activities are high for soil, vegetation , etc., but could be mitigated if all topsoil is stockpiled and eventually replaced in a orderly manner during rehabilitation phase.
3	Area 2: Cultivated area/ farm roads / grazing land	61,2 ha	See Sat image 1 & 2  The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural). Only a very small site is covered by Citrus trees.  The original vegetation cover has been totally replaced.	Prior to opencast mining starts , all the topsoil (Vertisol =Arcadia form) should be removed and stockpile for future replacement during rehabilitation phase.  This will allow the specific area to be returned to an agricultural area for future use with a grazing capability/potential in the future.	Medium	Environmental impact by future mining activities
4	Farm houses/ stores, etc.	3,14 ha	Operational  Sites not to be disturbed by opencast mining.	In terms of the Mine Health and Safety Act , 1996, no mining activities will be allowed 100 m from these farm structures. In some cases these structures are utilized as offices for the mine.	Not applicable.	
5	N4 Highway	4,65 ha	Operational  Sites not to be disturbed by opencast mining.	Ditto.	Not applicable.	



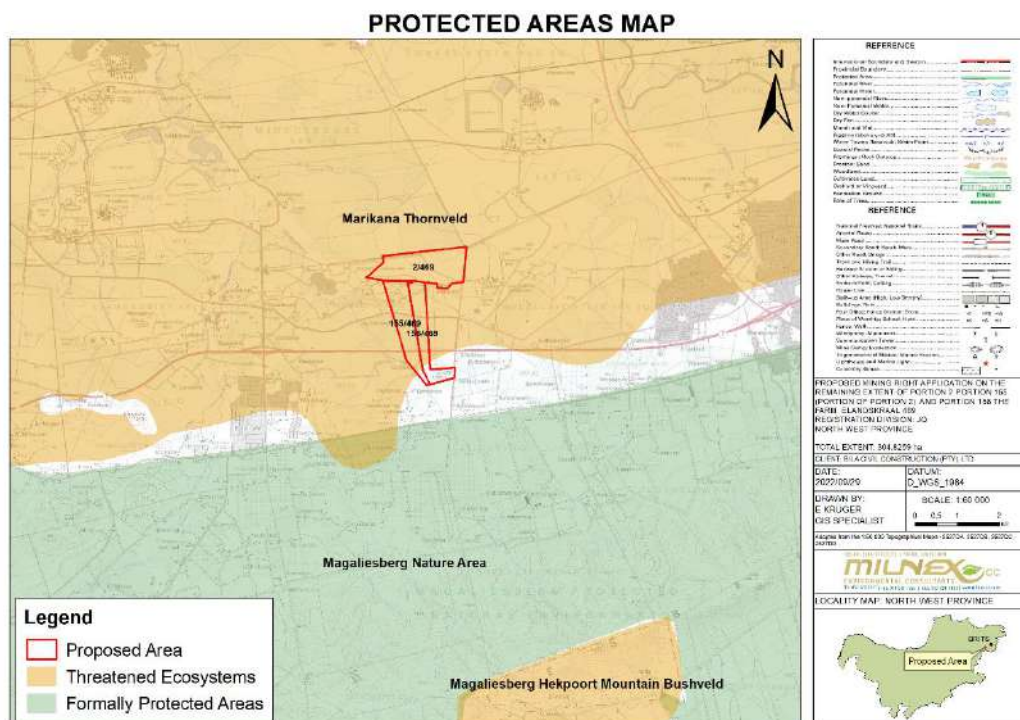
**THREATENED ECOSYSTEMS**

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver *et al.* 2011). Datasets have been developed by SANBI (2016) in order to outline threatened ecosystems, with the primary objective of limiting the rate of ecosystem extinctions. Four established categories group these ecosystems namely: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) and Protected.

According to **figure 10** the proposed area falls within the Marikana Thornveld threatened ecosystem.

**PROTECTED AREAS**

Formally protected areas are protected either by national or provincial legislation. Based on the SANBI (2010) Protected Areas Map (**Figure 13**), the proposed area does not overlap with any formally protected area. Therefore, the location of the study site is not expected to have an impact on any formally protected areas.



**Figure 16:** Threatened and Protected Areas Map

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

**4.2.7 South African Protected and Conservation Areas**  
*The National Biodiversity Assessment of 2011 Protected Areas layer was also consulted. The project area is within the Priority Focus Areas and conservation area (Figure 4-12).*

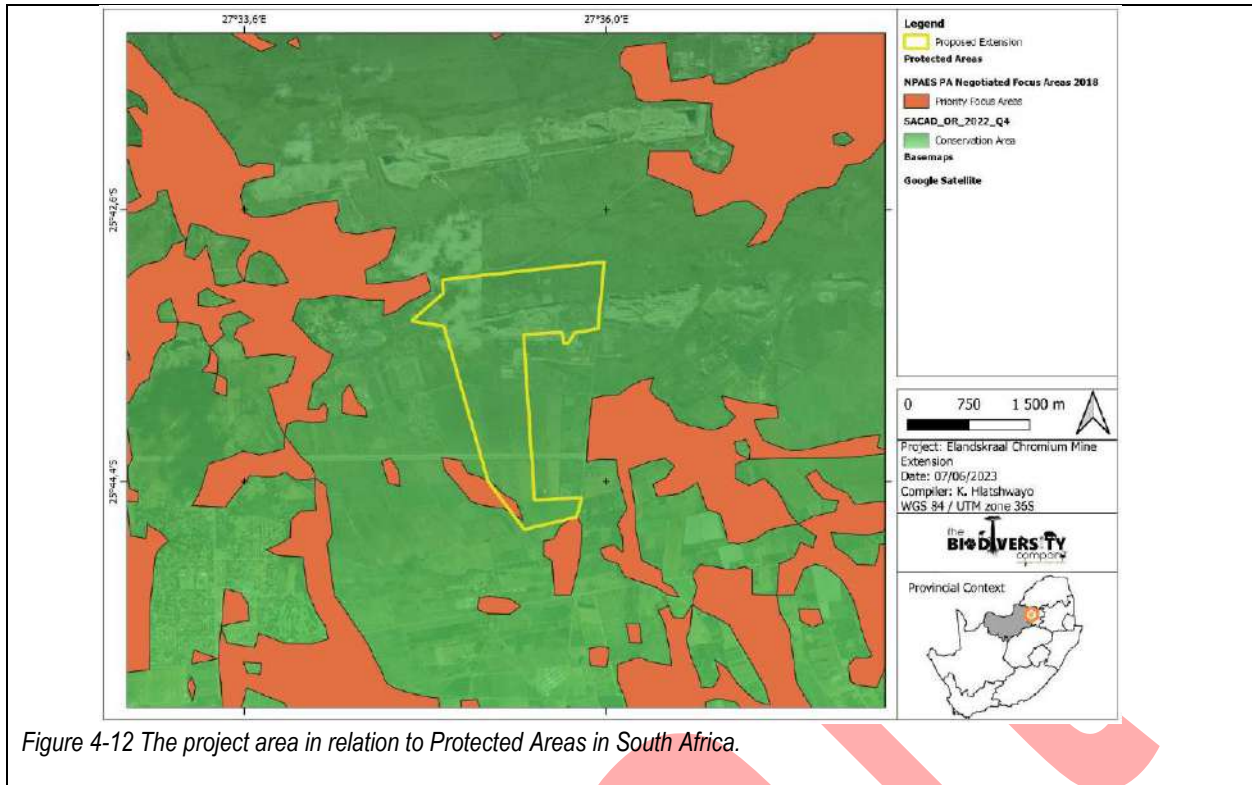


Figure 4-12 The project area in relation to Protected Areas in South Africa.

### TERRESTRIAL CRITICAL BIODIVERSITY AREA

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of high biodiversity value that need to be conserved and maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services (MTPA, 2014). According to the National Environmental Management Act (NEMA) (Act no. 107 of 1998) certain activities have strict guidelines or are prohibited within CBAs and ESAs. Refer to the listed activities under the NEMA: Environmental Impact Assessment Regulations of 2014 (GNR 982) as promulgated in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) [as amended] for a comprehensive breakdown. The following terms are used to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area One (CBA1);
- Critical Biodiversity Area Two (CBA2);
- Ecological Support Area (ESA);
- Other Natural Areas (ONA); and
- Protected Area (PA).

The proposed area falls within CBA2, ESA1 and ESA2, as illustrated on the map below (Figure 11).

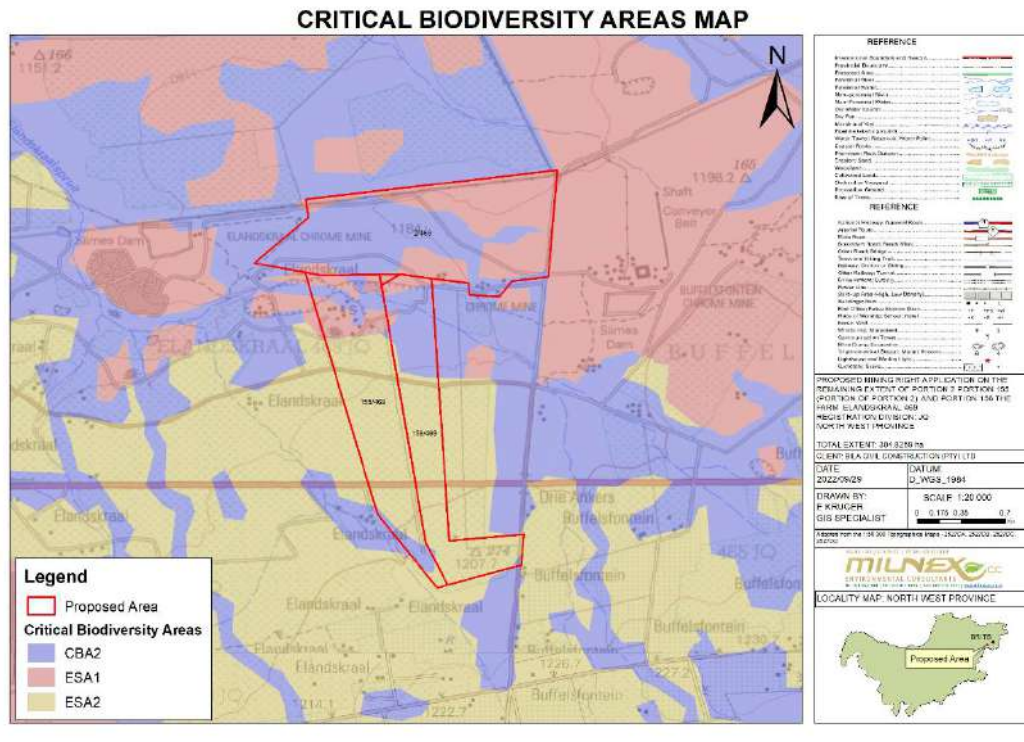


Figure 17: Critical Biodiversity Areas Map.

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

#### 2.4 Critical Biodiversity Areas and Ecological Support Areas

*Critical Biodiversity Areas are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.*

*The primary purpose of a map of Critical Biodiversity Areas and Ecological Support Areas is to guide decision-making about where best to locate development. It should inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes (SANBI Biodiversity Advisor, 2017).*

*The project area falls into CBA 2, ESA 1 and ESA 2 (Figure 3), although much of the area represent degraded land and cultivated land and should no longer be considered as CBA or ESAs. The natural thornveld areas represent ESA2 areas.*

According to the DFFE Screening Report the Terrestrial Biodiversity Theme Sensitivity is Very High but the colour of the map does not correlate with the colour for High sensitivity on the legend. Please see **Appendix 7** for the colour map.



Figure 18: Terrestrial Biodiversity Theme Sensitivity

According to the DFFE Screening Report the Animal Species theme sensitivity is mostly medium with other areas being Low. Please see **Appendix 7**.

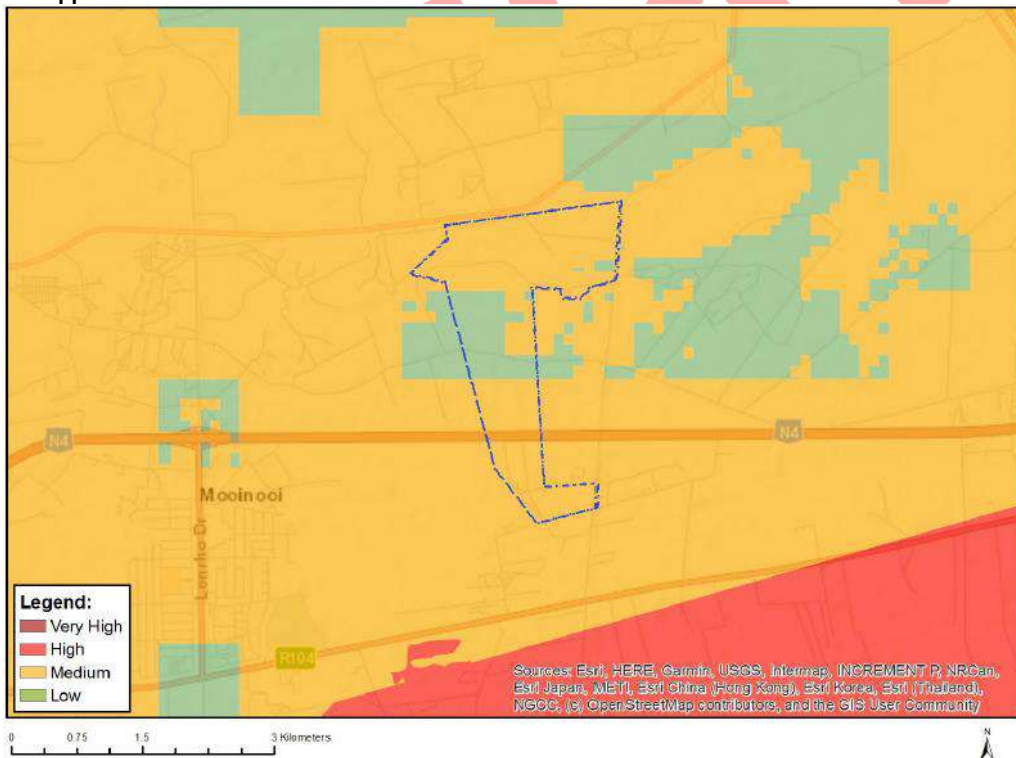


Figure 19: Animal Species theme sensitivity

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

#### **4.2 Fauna in and around the project area**

##### **4.2.1 Fauna habitat types**

*The number of mammal species supported by a plant community depends on several factors like the primary production, seasonal availability of resources, floral heterogeneity, diversity of plant structure, nature of the substratum and previous history (Delany, 1982). Each mammal species has a particular niche, which can be regarded as the sum of all ecological requirements of a species namely food, space, shelter and physical conditions. Mills & Hes (1997) stated that the distribution and abundance of animal species does not rigorously follow that of plant communities or biomes. Instead, mammal species seem to have certain preferences for a specific habitat type (Skinner & Smithers, 1990). Several authors have shown this preference of mammals to certain habitats through analysis (Beardall et al. 1984).*

*A survey was conducted during March 2021 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid.*

*Three habitat types were identified:*

- *Thornveld on clayey soils*
- *Wetland*
- *Cultivated fields*

##### **4.2.1.1 Mammal Habitat Assessment and species survey**

*Large and medium sized mammals that occurred historically in the larger study area, are absent from the area, owing to anthropogenic impacts in recent centuries. Most of the larger antelope and predator species are today confined to game reserves and national parks in South Africa and therefore will not occur naturally in the study area. This loss of large species means that the mammal diversity at the site is far from its original natural state not only in terms of species richness but also with regards to functional roles in the ecosystem. The majority of the habitat types on the respective study sites are fragmented. Therefore, the expected mammalian richness on these areas is considered low.*

*Predators that still roam freely in the area include larger predators such as leopard (Magaliesberg Mountain Range) and brown hyena, while smaller predators such as caracal and serval are common throughout the area. Antelope species such as duiker and steenbok will roam freely through the area and are not restricted by game fences. Smaller mammal species such as honey badgers and serval can become habituated to anthropogenic influences, while other species such as brown hyena will rather move away from the construction activities and will seldom use the area. Many of the bat species of conservation concern in the study area are cave-dependant for roosting. Any individuals that utilize the area would therefore either be foraging or migrating and would not be affected by the localized loss of habitat due to the development. The dominant species composition therefore comprises of widespread taxa with unspecialised life history traits. Most mammal species are highly mobile and will move away during construction. The impact will also be low if one compares the footprint of the development and the overall range of individual species. It is therefore considered highly unlikely that the species will be affected negatively by the development of the mine. The most important corridors that need to be preserved for free-roaming mammal species in the area include the natural vegetation associated with the thornveld and riparian zones. The connectivity of the project site to the remainder of the larger area is Moderate due to the wetland and thornveld, although the development of croplands, townships and planted pastures has fragmented the woodland areas.*

*The use of trapping techniques was not deemed necessary due to the agricultural activities in the area, although the development of the mine will have a significant impact on any small mammal species that may occur within the thornveld areas of the study area.*

*The mammals are mostly represented by generalised species such as rodents, scrub hares and smaller antelope (steenbok, common duiker) that will move through the area while foraging. Feral cats and dogs from the surroundings township occur scattered through the area. The close proximity of the informal settlements does however place constant pressure on the natural mammal populations and many of these populations will eventually disappear from the area completely.*

Mammals are sensitive to disturbances and habitat destruction and degradation and as such the anticipated species diversity of the study area would be low.

#### 4.2.2 Fauna species lists

Fauna species are listed if their distribution overlaps with Elandskraal 469 JQ.

Red list categories are as follows:

- **CR:** Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **EN:** Endangered, indicating that the species is facing a very high risk of extinction.
- **VU:** Vulnerable, indicating that the species is facing a high risk of extinction.
- **NT:** Near Threatened, is likely to become at risk of extinction in the near future.
- **Declining:** A species is Declining when there are threatening processes causing a continuing decline of the species.
- **LC:** Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

**Table 15: Mammals (The 2016 Mammal Red List of South Africa Lesotho and Swaziland)**

Scientific name	English name	Red list Category	Suitable habitat in project area
<i>Redunca fulvorufula fulvorufula</i>	Mountain Reedbuck	Endangered	No
<i>Panthera pardus</i>	Leopard	Vulnerable	Yes
<i>Hippotragus niger niger</i>	Sable Antelope	Vulnerable	No
<i>Parahyaena brunnea</i>	Brown Hyaena	Near Threatened	Yes
<i>Atelerix frontalis</i>	South African Hedgehog	Near Threatened	Yes
<i>Otomys auratus</i>	Vlei Rat (Grassland type)	Near Threatened	Yes
<i>Aepyceros melampus melampus</i>	Impala	Least Concern	No
<i>Alcelaphus buselaphus caama</i>	Red Hartebeest	Least Concern	No
<i>Antidorcas marsupialis</i>	Springbok	Least Concern	No
<i>Connochaetes gnou</i>	Black Wildebeest	Least Concern	No
<i>Connochaetes taurinus taurinus</i>	Blue Wildebeest	Least Concern	No
<i>Damaliscus pygargus phillipsi</i>	Blesbok	Least Concern	No
<i>Giraffa camelopardalis giraffa</i>	South African Giraffe	Least Concern	No
<i>Kobus ellipsiprymnus ellipsiprymnus</i>	Common Waterbuck	Least Concern	No
<i>Oreotragus oreotragus</i>	Klipspringer	Least Concern	Yes
<i>Oryx gazella</i>	Gemsbok	Least Concern	No
<i>Phacochoerus africanus</i>	Common Warthog	Least Concern	Yes

<i>Potamochoerus larvatus</i>	Bushpig	Least Concern	No
<i>Raphicerus campestris</i>	Steenbok	Least Concern	Yes
<i>Tragelaphus angasii</i>	Nyala	Least Concern	No
<i>Tragelaphus oryx</i>	Common Eland	Least Concern	No
<i>Tragelaphus strepsiceros</i>	Greater Kudu	Least Concern	No
<i>Tragelaphus sylvaticus</i>	Southern Bushbuck	Least Concern	No
<i>Atilax paludinosus</i>	Water Mongoose	Least Concern	No
<i>Canis mesomelas</i>	Black-backed Jackal	Least Concern	Yes
<i>Caracal caracal</i>	Caracal	Least Concern	Yes
<i>Genetta maculata</i>	Rusty-spotted Genet	Least Concern	Yes
<i>Herpestes sanguineus</i>	Slender Mongoose	Least Concern	Yes
<i>Mellivora capensis</i>	Honey Badger	Least Concern	Yes
<i>Proteles cristata</i>	Aardwolf	Least Concern	Yes
<i>Vulpes chama</i>	Cape Fox	Least Concern	Yes
<i>Myosorex varius</i>	Forest Shrew	Least Concern	Yes
<i>Procavia capensis</i>	Rock Hyrax	Least Concern	No
<i>Lepus victoriae</i>	African Savanna Hare	Least Concern	Yes
<i>Pronolagus randensis</i>	Jameson's Red Rock Rabbit	Least Concern	No
<i>Elephantulus myurus</i>	Eastern Rock Sengi	Least Concern	Yes
<i>Equus quagga</i>	Plains Zebra	Least Concern	No
<i>Chlorocebus pygerythrus</i>	Vervet Monkey	Least Concern	Yes
<i>Galago moholi</i>	Southern Lesser Galago	Least Concern	Yes
<i>Papio ursinus</i>	Chacma Baboon	Least Concern	Yes
<i>Aethomys ineptus</i>	Tete Veld Rat	Least Concern	Yes
<i>Cryptomys</i> spp.	Common Mole-rat	Least Concern	Yes
<i>Hystrix africaeaustralis</i>	Cape Porcupine	Least Concern	Yes
<i>Lemniscomys rosalia</i>	Single-striped Mouse	Least Concern	Yes
<i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	Least Concern	Yes
<i>Mus minutoides</i>	Pygmy Mouse	Least Concern	Yes
<i>Otomys angoniensis</i>	Angoni Vlei Rat	Least Concern	Yes
<i>Pedetes capensis</i>	Springhare	Least Concern	No
<i>Rhabdomys</i> spp.	Four-striped Grass Mouse	Least Concern	Yes
<i>Thallomys paedulcus</i>	Tree Rat	Least Concern	Yes

#### 4.2.1.3 Reptiles and Amphibians Assessment and species survey

The amphibians appear to be poorly represented on site. The most probable habitat to find frogs is in the seasonal pools associated with the wetland area. Amphibian species potentially occurring in the larger area associated with the Apies River include Common River Frog, Natal Sand Frog, Gutteral Toad, Raucous Toad and Bubbling Kassina. These species are non-threatened and widespread species, and as such the development will not have any impact on amphibian conservation within the region.

Reptile species such as the southern rock python, the black mamba, puff adder, boomslang, vine snake, spotted bush snake and several members of the green snakes (*Philothamnus* spp.) is expected to occur in the larger area. The presence of these snakes is dependant on the presence of their prey species (rodents, frogs etc.), and therefore snakes might utilize this area from time to time. The general habitat type for reptiles consists of open to very dense bushveld, with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. Arboreal species are the more prominent components of the local herpetofauna.

**Table 17: Amphibians (Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland, 2004)**

Scientific name	English name	Red list Category	Suitable habitat in project area
<i>Sclerophrys garmani</i>	Eastern Olive Toad	Least Concern	Yes
<i>Sclerophrys gutturalis</i>	Guttural Toad	Least Concern	Yes
<i>Sclerophrys capensis</i>	Raucous Toad	Least Concern	Yes
<i>Schismaderma carens</i>	Red Toad	Least Concern	Yes
<i>Kassina senegalensis</i>	Bubbling Kassina	Least Concern	Yes
<i>Cacosternum boettgeri</i>	Boettger's Caco	Least Concern	Yes
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	Least Concern	Yes
<i>Xenopus laevis</i>	Common Platanna	Least Concern	Yes
<i>Amietia fuscigula</i>	Common River Frog	Least Concern	Yes
<i>Ptychadena anchietae</i>	Plain Grass Frog	Least Concern	Yes
<i>Ptychadena mossambica</i>	Broad-banded Grass Frog	Least Concern	Yes
<i>Tomopterna cryptotis</i>	Tremolo Sand Frog	Least Concern	Yes
<i>Tomopterna natalensis</i>	Natal Sand Frog	Least Concern	Yes

**Table 18: Reptiles (Atlas and Red list of the Reptiles of South Africa, Lesotho and Swaziland, 2014)**

Scientific name	English name	Red list Category	Suitable habitat in project area
<i>Lygodactylus capensis capensis</i>	Common Dwarf Gecko	Least Concern	Yes
<i>Lygodactylus ocellatus ocellatus</i>	Spotted Dwarf Gecko	Least Concern	Yes
<i>Pachydactylus affinis</i>	Transvaal Gecko	Least Concern	Yes
<i>Nucras intertexta</i>	Spotted Sandveld Lizard	Least Concern	No
<i>Nucras lalandii</i>	Delalande's Sandveld Lizard	Least Concern	No
<i>Pedioplanis lineoocellata lineoocellata</i>	Spotted Sand Lizard	Least Concern	No
<i>Cordylus vittifer</i>	Common Girdled Lizard	Least Concern	Yes
<i>Pseudocordylus melanotus melanotus</i>	Common Crag Lizard	Least Concern	No
<i>Gerrhosaurus flavigularis</i>	Yellow-Throated Plated Lizard	Least Concern	Yes
<i>Afroablepharus wahlbergii</i>	Wahlberg's Snake-Eyed Skink	Least Concern	Yes
<i>Mochlus sundevallii sundevallii</i>	Sundevall's Writhing Skink	Least Concern	No
<i>Trachylepis capensis</i>	Cape Skink	Least Concern	Yes
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	Least Concern	Yes
<i>Trachylepis varia</i>	Variable Skink	Least Concern	Yes
<i>Varanus albigularis albigularis</i>	Southern Rock Monitor	Least Concern	Yes
<i>Chamaeleo dilepis dilepis</i>	Common Flap-Neck Chameleon	Least Concern	Yes
<i>Agama aculeata distanti</i>	Eastern Ground Agama	Least Concern	Yes
<i>Agama atra</i>	Southern Rock Agama	Least Concern	Yes



<i>Afrotrophlops bibronii</i>	Bibron's Blind Snake	Least Concern	Yes
<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	Least Concern	Yes
<i>Leptotyphlops scutifrons</i>	Peters' Thread Snake	Least Concern	Yes
<i>Bitis arietans arietans</i>	Puff Adder	Least Concern	Yes
<i>Bitis caudalis</i>	Horned Adder	Least Concern	Yes
<i>Causus rhombeatus</i>	Rhombic Night Adder	Least Concern	Yes
<i>Atractaspis bibronii</i>	Bibron's Stiletto Snake	Least Concern	Yes
<i>Lycodonomorphus rufulus</i>	Brown Water Snake	Least Concern	Yes
<i>Lycophidion capense capense</i>	Cape Wolf Snake	Least Concern	Yes
<i>Psammophis brevirostris</i>	Short-Snouted Grass Snake	Least Concern	Yes
<i>Psammophylax rhombeatus rhombeatus</i>	Spotted Grass Snake	Least Concern	Yes
<i>Psammophylax tritaeniatus</i>	Striped Grass Snake	Least Concern	Yes
<i>Pseudaspis cana</i>	Mole Snake	Least Concern	Yes
<i>Naja annulifera</i>	Snouted Cobra	Least Concern	Yes
<i>Crotaphopeltis hotamboeia</i>	Red-Lipped Snake	Least Concern	Yes
<i>Dasypeltis scabra</i>	Rhombic Egg-Eater	Least Concern	Yes
<i>Philothamnus natalensis occidentalis</i>	Western Natal Green Snake	Least Concern	Yes

### AQUATIC CRITICAL BIODIVERSITY AREA

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

#### 4.2.2 Critical Biodiversity Areas and Ecological Support Areas

ESAs are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of the restriction on land use and resource use in these areas may be lower than that recommended for CBAs (NWREAD, 2015). The project footprint overlaps with an ESA 1 and ESA 2 aquatic areas and drains into a CBA 1 and CBA 2 aquatic resource.

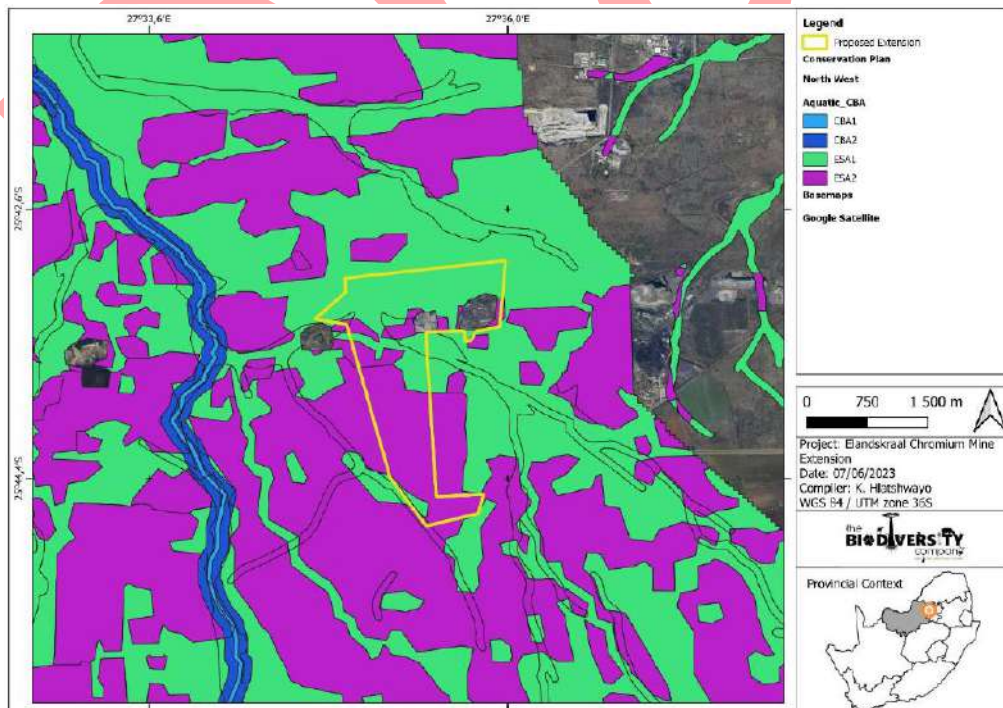


Figure 4-6 Map illustrating the conservation plan in relation to the project area.

According to the DFFE Screening Report the Aquatic Biodiversity Theme Sensitivity is mostly Very High. Please see **Appendix 7** for the colour map.

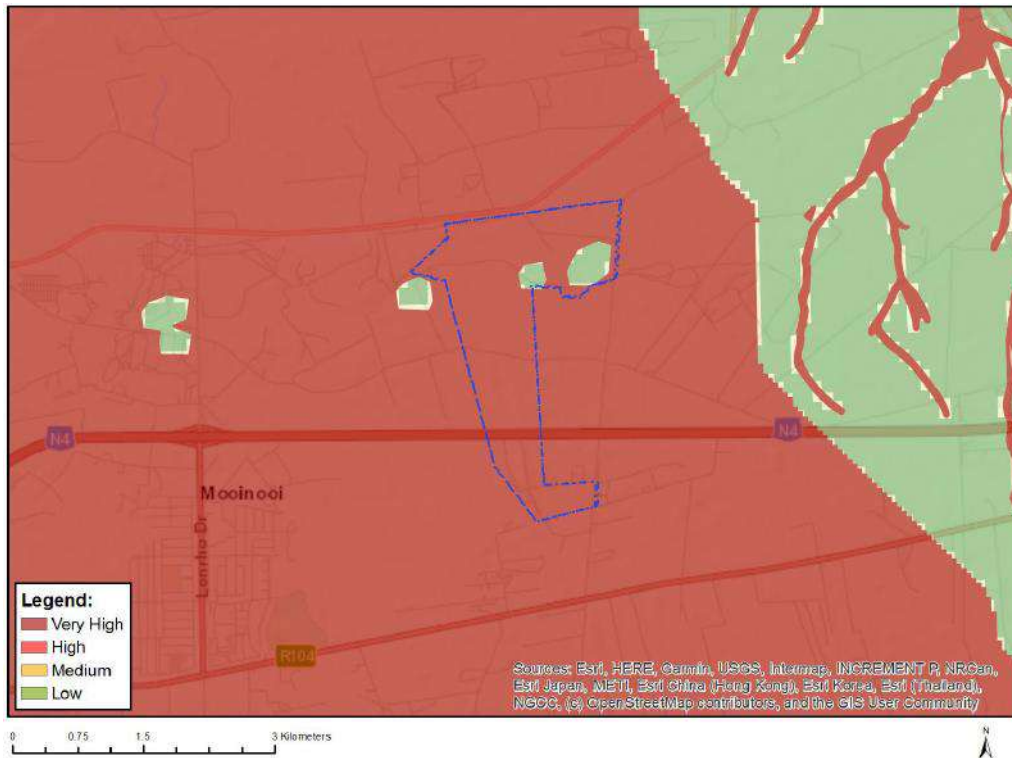


Figure 20: Aquatic Biodiversity Theme Sensitivity

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

**4.2.3 NFEPA's for Sub-Quaternary Reach A21K - 01028**

The Elandskraal Chromium Mine extension has the potential to impact the A21K - 01028 SQR and two of its associated tributaries. This project area falls within the A21K catchment which according to Nel et al. (2011), is a Fish Support Area (FSA) (Figure 7 and Figure 8). The species of concern within the FSA is *Enteromius motebensis*.

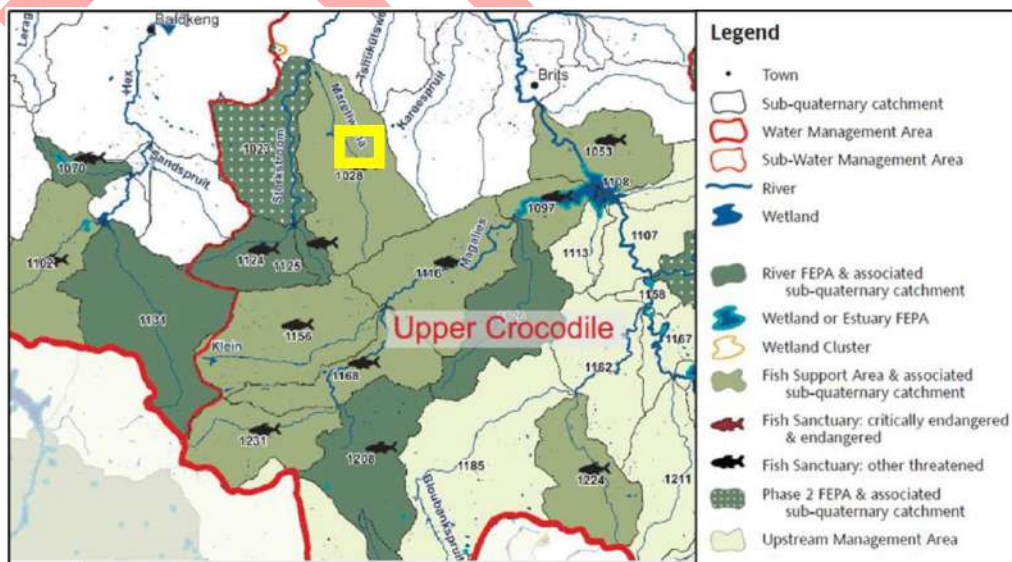


Figure 7: Map illustrating fish and river FEPA's for the project area, the project area is represented by the yellow square (Nel et al., 2011)

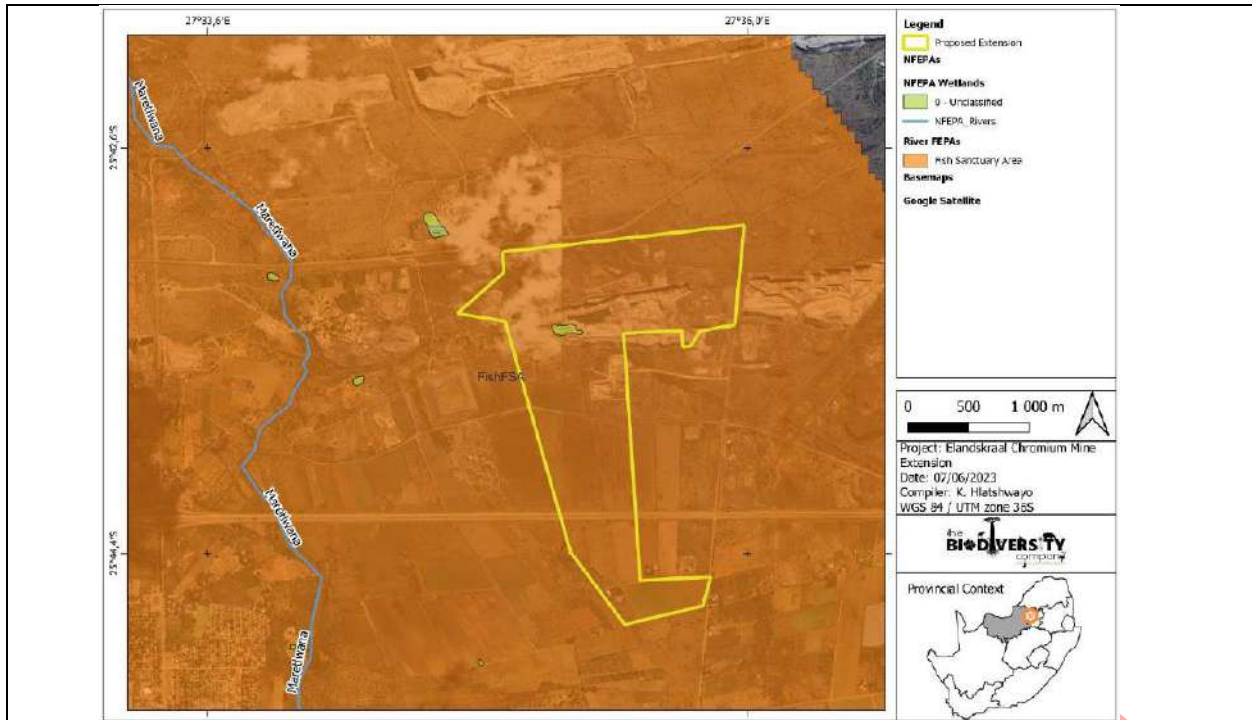


Figure 8: Map illustrating NFEPA in relation to the project area.

#### 4.2.6 Aquatic Ecosystem Protection Level

The project area was superimposed on the ecosystem protection level map to assess the protection status of aquatic ecosystems associated with the development (Figure 4-11). According to the SAIIAE dataset, the project area and surrounding/proximal watercourses are drained by a 'Not Protected' system.

#### 6.6 Environmental Screening Tool

The National Web-based Environmental Screening Tool has characterised the aquatic sensitivity of the project area as "Very High" (Figure 26). This was due to the project area being within the aquatic CBAs. The desktop assessment and site visit agreed with this rating. The reach is susceptible to further impacts, particularly on water quality and physical disturbances to instream and riparian habitat. The freshwater ecology of the immediate project area and further downstream areas is considered sensitive to disturbance from a hydrological and biological perspective. This will include the Maredwana River downstream of the project area, which is considered sensitive due to the ecosystem services that these watercourse features provide. The construction and operational activities must take cognizance of this and avoid any unnecessary disturbance of the watercourse and adjacent habitat.

### BIODIVERSITY PRIORITY AREAS FOR MINING

The Mining and Biodiversity Guideline was developed in 2013 for the purpose of mainstreaming biodiversity management practices into the mining sector (DEA, DMRE, Chamber of Mines, SAMBF & SANBI 2013). This Guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining. The Guideline distinguishes between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service perspective as well as the implications for mining in these areas (Table 2).

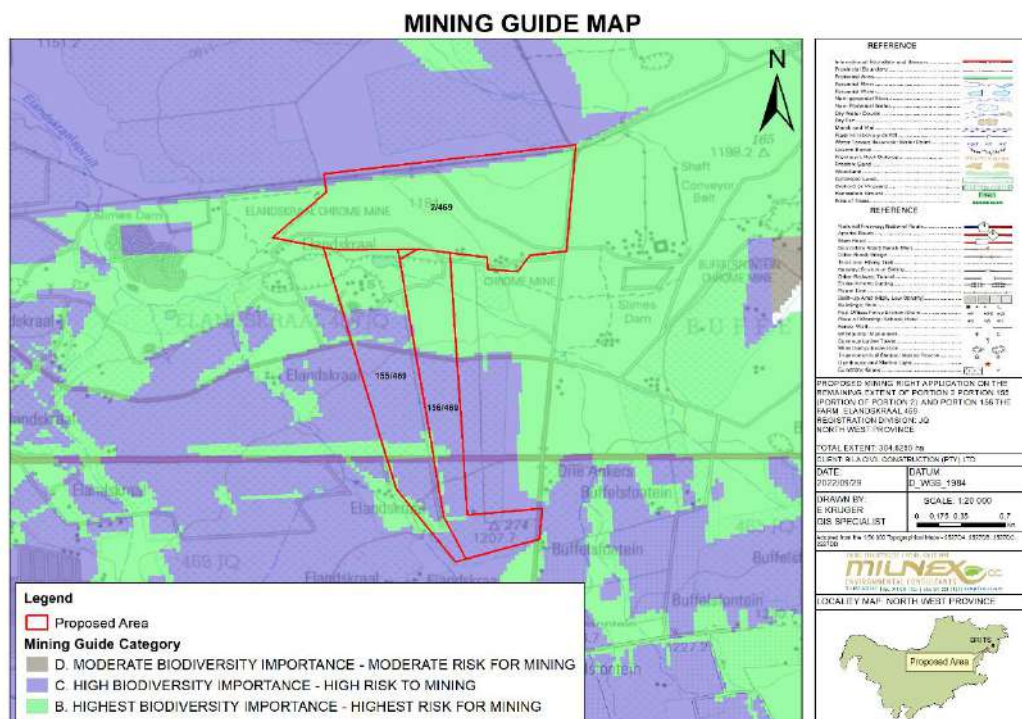
**Table 2:** Four categories of biodiversity priority areas in relation to their biodiversity importance and implications for mining.

Category	Biodiversity Priority Areas	Risks for Mining	Implications for Mining
<b>A. Legally Protected</b>	<ul style="list-style-type: none"> <li>Protected areas (including National Parks, Nature Reserves, World Heritage Sites, Protected</li> </ul>	<b>Mining Prohibited</b>	Mining projects cannot commence as mining is legally prohibited. Although mining is prohibited in Protected Areas, it may be allowed in Protected Environments if

	<p>Environments, Nature Reserves)</p> <ul style="list-style-type: none"> <li>• Areas declared under Section 49 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002)</li> </ul>		<p>both the Minister of Mineral Resources and Minister of Environmental Affairs approve it.</p> <p>In cases where mining activities were conducted lawfully in protected areas before Section 48 of the Protected Areas Act (No. 57 of 2003) came into effect, the Minister of Environmental Affairs may, after consulting with the Minister of Mineral Resources, allow such mining activities to continue, subject to prescribed conditions that reduce environmental impacts.</p>
<p><b>B. Highest Biodiversity Importance</b></p>	<ul style="list-style-type: none"> <li>• Critically endangered and endangered ecosystems</li> <li>• Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans</li> <li>• River and wetland Freshwater Ecosystem Priority Areas (FEPAs) and a 1km buffer around these FEPAs</li> <li>• Ramsar Sites</li> </ul>	<p><b>Highest Risk for Mining</b></p>	<p>Environmental screening, environmental impact assessment (EIA) and their associated biodiversity specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licences, and environmental authorisations.</p> <p>If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being.</p> <p>An EIA should include the strategic assessment of optimum, sustainable land use for an area and will determine the significance of the impact on biodiversity.</p> <p>This assessment should fully consider the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country.</p> <p>Authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts and may specify biodiversity offsets that would be written into licence agreements and/or authorisations.</p>
<p><b>C. High Biodiversity Importance</b></p>	<ul style="list-style-type: none"> <li>• Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves)</li> <li>• Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas)</li> <li>• Other identified priorities from provincial spatial biodiversity plans</li> <li>• High water yield areas</li> <li>• Coastal Protection Zone</li> <li>• Estuarine functional zone</li> </ul> <p>*Note that the status of buffer areas of World Heritage Sites is subject to a current intra-governmental process</p>	<p><b>High Risk for Mining</b></p>	<p>These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, and for maintaining important ecosystem services for communities or the country.</p> <p>An EIA should include an assessment of optimum, sustainable land use for an area and will determine the significance of the impact on biodiversity.</p> <p>Mining options may be limited in these areas, and limitations for mining projects are possible.</p> <p>Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.</p>

<p><b>D. Moderate Biodiversity Importance</b></p>	<ul style="list-style-type: none"> <li>• Ecological support areas</li> <li>• Vulnerable ecosystems</li> <li>• Focus areas for protected area expansion (land-based and offshore protection)</li> </ul>	<p><b>Moderate Risk for Mining</b></p>	<p>These areas are of moderate biodiversity value.</p> <p>EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened (land-based and offshore protection) species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy.</p> <p>Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.</p>
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Based on **Figure 21**, the area overlaps with Category B and C



**Figure 21:** Biodiversity priority areas, in accordance with the Mining of Biodiversity Guidelines, associated with the study site.

### WETLAND AREAS

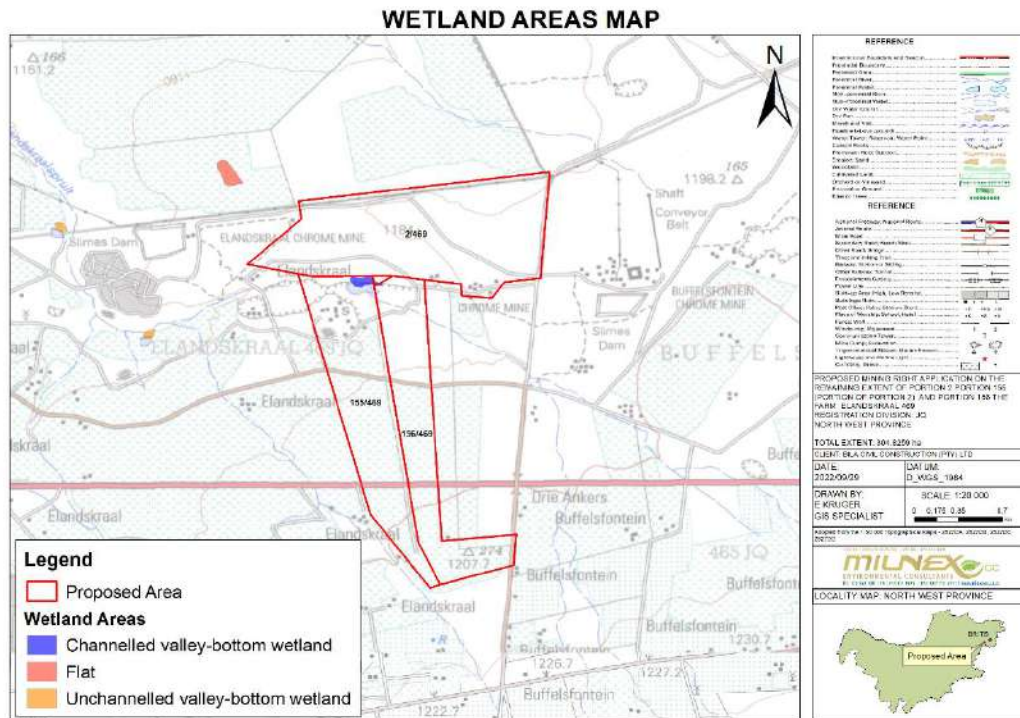
In terms of Section 1 of the National Water Act (No. 36 of 1998) (NWA), wetlands are legally defined as: “*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*” (NWA 1998).

Wetlands are defined by the presence of unique soils and vegetation that do not occur in terrestrial and purely aquatic environments (Edwards *et al.* 2018). Wetland soils are referred to as hydric soils that develop under anaerobic conditions (condition where oxygen is virtually absent from the soil). Wetlands are also typically characterized by relatively large and dense stands of plants sticking out of shallow water or wet soil. Plants adapted to such waterlogged conditions are referred to as hydrophytes. Wetlands are distinct from true aquatic ecosystems like river ecosystems, which are characterized by fast flowing water within channels, and lake ecosystems, that are flooded to great depth; both of which are not primarily characterized by the occurrence of hydric soils and hydrophytes.

A wide variety of wetland types are present in South Africa, and can be classified into six broad types, namely floodplain wetlands, unchannelled valley bottom wetlands, channelled valley bottom wetlands, seeps, depressions and wetland flats. Owing to the large variations in climate and topography across South Africa, vegetation and habitat associated with these wetland types vary tremendously from subtropical reed beds and tall swamp forests to arid salt pans, which all support unique and varied animal life.

**Figure 22** illustrates all wetland types associated with the study site. On the proposed area there is a Channelled valley-bottom wetland.

However according to the Riverine Baseline specialist study, the data used which represents a synthesis of a wide number of official watercourse data, including rivers, inland wetlands and estuaries, does not recognise the presence of wetlands within the extent of the project area.



**Figure 22:** Wetland types associated with the study site

The Wetland vegetation that the site has been associated with the Central Bushveld Group 2 and Group 5, as depicted in the figure below.



A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

#### 4.2.4 National Wetland Map 5

The National Wetland Map 5 (NWM5) spatial data was published in October 2019 (Deventer et al. 2019), in collaboration with the South African National Biodiversity Institute (SANBI), with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data, including rivers, inland wetlands and estuaries. This database does not recognise the presence of wetlands within the extent of the project area (Figure 4-9).

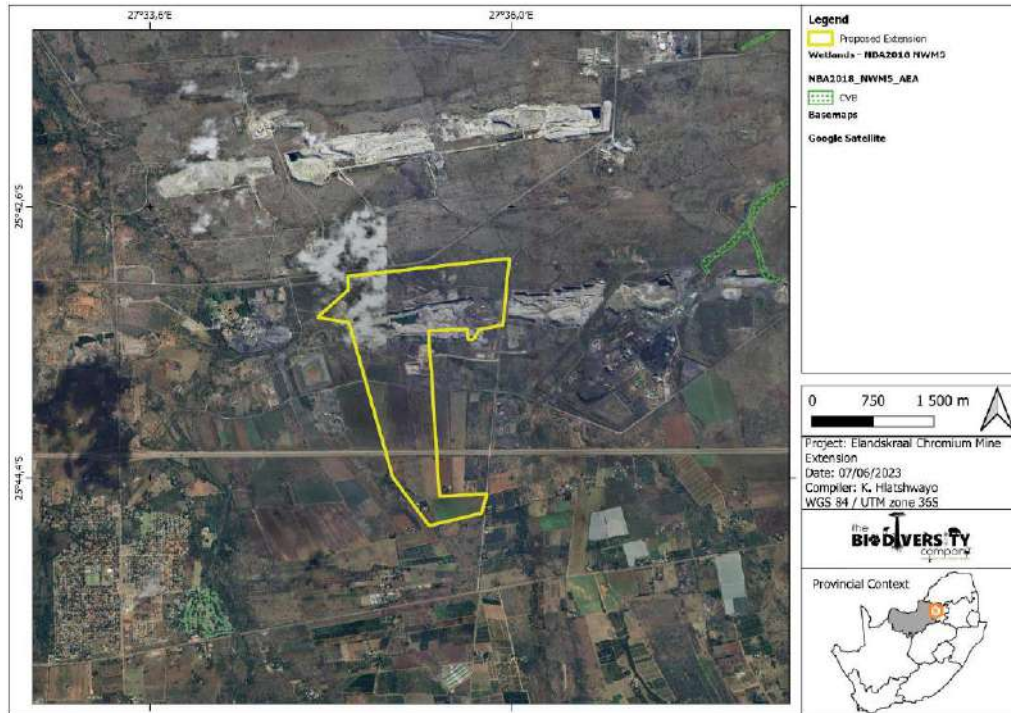


Figure 4-9 The project area in relation to the National Wetland Map version 5.

#### IMPORTANT BIRD AND BIODIVERSITY AREAS

Important Bird and Biodiversity Areas (IBAs) are a network of sites that are significant for the long-term viability of naturally occurring bird populations (Birdlife 2019). Many sites are also important for other forms of biodiversity; therefore, the conservation of Important Bird & Biodiversity Areas ensures the survival of a correspondingly large number of other animals and plants.

An IBAs were identified within the vicinity of the study site (Figure 24).



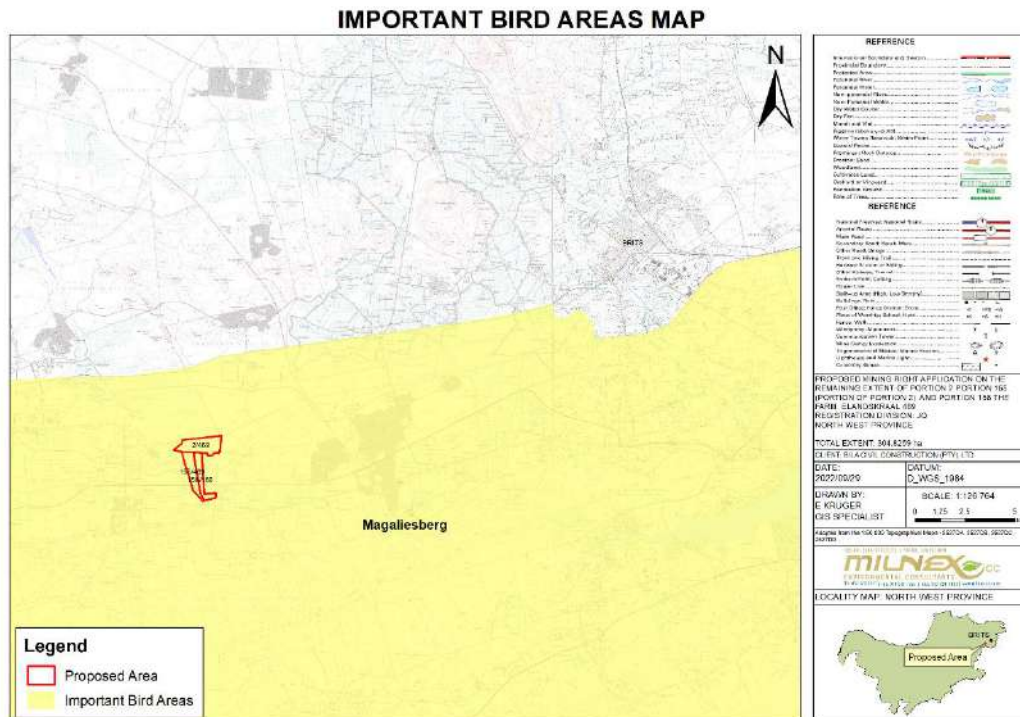


Figure 24: Important Bird and Biodiversity Areas associated with the study site.

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

#### 4.2.1.2 Avifaunal Habitat Assessment and species survey

Three major bird habitat systems were identified within the borders of the study site, including the woodland, cultivated land or old fields and wetlands (including riparian zone).

Most bird species identified within the study area are common species known to nest within or utilise the microphyllous woodland habitat in the region and may be either permanently or occasionally present within the study area. According to Birdlife South Africa, the study area falls inside the Magaliesberg Important Bird Area (IBA), identified within South Africa (Marnewick et al., 2015), although the habitat on site do not represent typical avifauna habitats associated with the Magaliesberg Range.

Microphyllous woodland usually supports much higher bird numbers compared to the broadleaved woodlands. The ground cover between the trees consists of mainly short grasses interspersed with shrubs (Barnes, 1998). The plains area represents microphyllous woodland and supports many smaller bird species such as Ashy Tit, Pied Babbler, Kalahari Robin, Burntnecked Eremomela, Desert Barred Warbler, Marico Flycatcher, Pirit Batis, Crimsonbreasted Shrike, Longtailed Shrike, Threestreaked Tchagra, Great Sparrow, Whitebrowed Sparrowweaver, Scalyfeathered Finch, Violeteared Waxbill and Blackcheeked Waxbill.

Most bird species identified within the study area are common species known to nest within or utilise the old fields, riparian woodland and microphyllous woodland habitat in the region and may be either permanently or occasionally present within the study area. The old fields and cultivated areas represent degraded grassland and homogenous stands of crops that occurs throughout the study area. In general terms the open grassland patches could attract the White-bellied Korhaans, and White Stork and Abdim's Stork. The open grassland patches are also a favourite foraging area for non-Red Data game birds such as Swainson's Spurfowl and Helmeted Guineafowl. This in turn could attract large birds of prey because of both the presence and accessibility of prey. Many habitat generalist species utilize this habitat type predominantly for foraging and hunting purposes.

The conservation status of many of the bird species that are dependent on wetlands reflects the critical status of wetland nationally, with many having already been destroyed. The non-perennial river and wetland pocket will not be disturbed during the proposed development though.

#### 4.2.2 Fauna species lists

Only avifauna species of conservation concern is listed.

Red list categories are as follows:

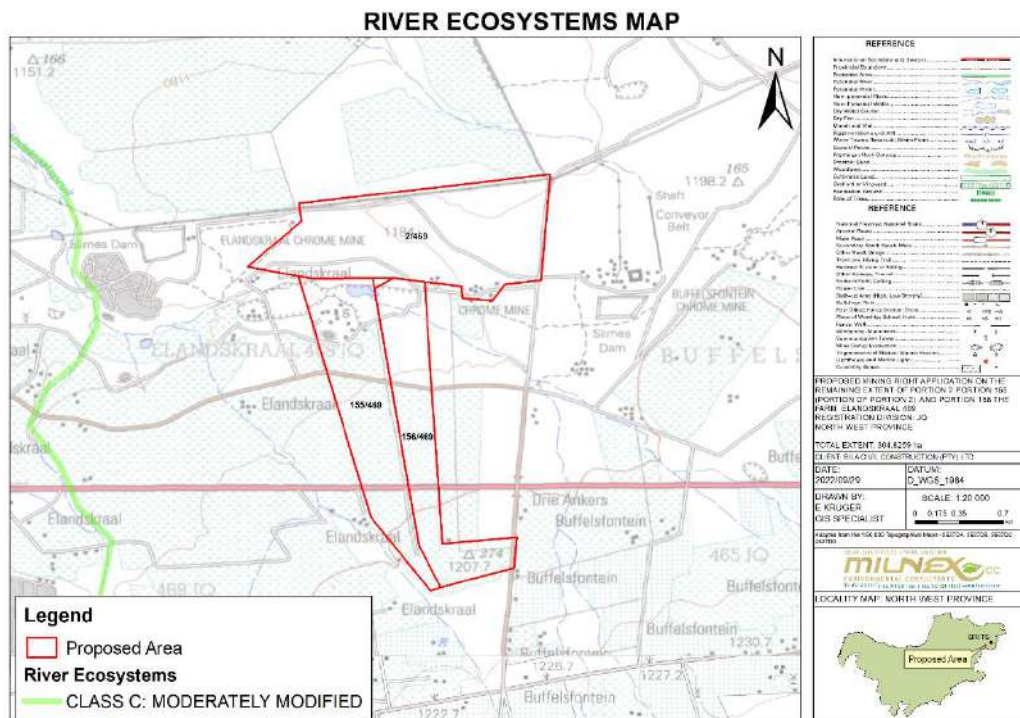
- **CR:** Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **EN:** Endangered, indicating that the species is facing a very high risk of extinction.
- **VU:** Vulnerable, indicating that the species is facing a high risk of extinction.
- **NT:** Near Threatened, is likely to become at risk of extinction in the near future.
- **Declining:** A species is Declining when there are threatening processes causing a continuing decline of the species.
- **LC:** Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

Table 16: Birds (The 2015 Eskom Red Data Book of BIRDS)

Scientific name	English name	Red list Category	Suitable habitat in project area
<i>Gyps africanus</i>	White-backed Vulture	Critically Endangered	No
<i>Polemaetus bellicosus</i>	Martial Eagle	Endangered	No
<i>Aquila rapax</i>	Tawny Eagle	Endangered	Yes
<i>Circus ranivorus</i>	African Marsh Harrier	Endangered	Yes
<i>Mycteria ibis</i>	Yellow-billed Stork	Endangered	Yes
<i>Gyps coprotheres</i>	Cape Vulture	Endangered	No
<i>Aquila verreauxii</i>	Verreauxs' Eagle	Vulnerable	No
<i>Falco biarmicus</i>	Lanner Falcon	Vulnerable	Yes
<i>Podica senegalensis</i>	African Finfoot	Vulnerable	No
<i>Gorsachius leuconotus</i>	White-backed Night Heron	Vulnerable	No
<i>Eupodotis senegalensis</i>	White-bellied Korhaan	Vulnerable	No
<i>Tyto capensis</i>	African Grass Owl	Vulnerable	Yes
<i>Pelecanus onocrotalus</i>	Great White Pelican	Vulnerable	No
<i>Pelecanus rufescens</i>	Pink-backed Pelican	Vulnerable	No
<i>Sagittarius serpentarius</i>	Secretarybird	Vulnerable	No
<i>Ciconia nigra</i>	Black Stork	Vulnerable	No
<i>Sterna caspia</i>	Caspian Tern	Vulnerable	No
<i>Anthropoides paradiseus</i>	Blue Crane	Near Threatened	Yes
<i>Numenius arquata</i>	Eurasian Curlew	Near Threatened	No
<i>Oxyura maccoa</i>	Maccoa Duck	Near Threatened	No
<i>Falco vespertinus</i>	Red-footed Falcon	Near Threatened	Yes
<i>Phoenicopterus roseus</i>	Greater Flamingo	Near Threatened	No
<i>Phoeniconaias minor</i>	Lesser Flamingo	Near Threatened	No
<i>Circus macrourus</i>	Pallid Harrier	Near Threatened	Yes
<i>Alcedo semitorquata</i>	Half-collared Kingfisher	Near Threatened	Yes
<i>Rostratula benghalensis</i>	Greater Painted-snipe	Near Threatened	No
<i>Glareola nordmanni</i>	Black-winged Pratincole	Near Threatened	Yes
<i>Coracias garrulus</i>	European Roller	Near Threatened	Yes
<i>Pterocles gutturalis</i>	Yellow-throated Sandgrouse	Near Threatened	Yes
<i>Ciconia abdimii</i>	Abdim's Stork	Near Threatened	Yes
<i>Leptoptilos crumeniferus</i>	Marabou Stork	Near Threatened	No

**RIVER ECOSYSTEM STATUS**

According to **Figure 25**, West from the proposed area the Elandskraalspruit falls in Class C: Moderately modified.



**Figure 25:** Ecosystem status of the rivers occurring in close proximity to the study site.

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

**4. Description of the Project Area**  
 The project area was situated in the A21K quaternary catchment within the Limpopo (NWA., 2016) Water Management Area (WMA - 1). The watercourses associated with the proposed mine extension was the perennial A21K - 01028 Sub Quaternary Reach (SQR) (Maretlwana River) along with two of its non-perennial unnamed tributaries. The watercourses are situated in the Bushveld basin – Lower Aquatic Ecoregion. The tributaries flow north west until a confluence with a 27.14 long reach of the Maretlwana River. This reach was regarded as seriously modified (class D) with a high Ecological Importance (EI) and Ecological Sensitivity (ES) at desktop level (DWS, 2014).

**4.3 Investigation Sites**  
 The first survey was conducted on the 24th of March 2020 which constitutes a wet season survey. A second survey was conducted on the 1st of June 2023, which constitutes a dry season survey.

A total of 12 sampling points were selected for this assessment. The site selection criteria were chosen to ascertain the spatial effects of the local activities which will assist to determine the extent of existing impacts in the project area. Sites were selected up, adjacent and downstream of the proposed activities along the Maretlwana River (M1 and M2). Sites M7, M8, M9, M10 and M11 were selected to understand the current state of the associated tributaries of the Maretlwana River. Sites M3, M4, M5, M6, M7, M9, M10, M11, and M12 are considered to be along the southern tributary while M8 is along the northern tributary. Contour lines indicate that runoff within portion 2 of the Elandskraal Chromium Mine will drain into the southern tributary (Figure 13)

It is noted that the unnamed tributary of the Maretlwana River was open cast mined which has resulted in the collection of water within the voids (M3, M4, M5, M6 and M12). These voids were assessed during the survey as these were located within the project boundary. It is further noted that the function of the voids was not evident during the compilation of this report. It is assumed that these structures perform multiple functions such as to contain contaminated water that is utilised in ore processing and impede or divert discharge from the unnamed tributary. These voids are not considered Pollution Control Dams (PCD's) for the mining activities as they do not meet requirements to be classed as such, as they are not lined or part of an existing Stormwater Management Plan (SWMP). They are considered a dirty water storage area for the assessment. The selected site locations can be seen in Figure 13. Site photographs and GPS coordinates are presented in Table 2

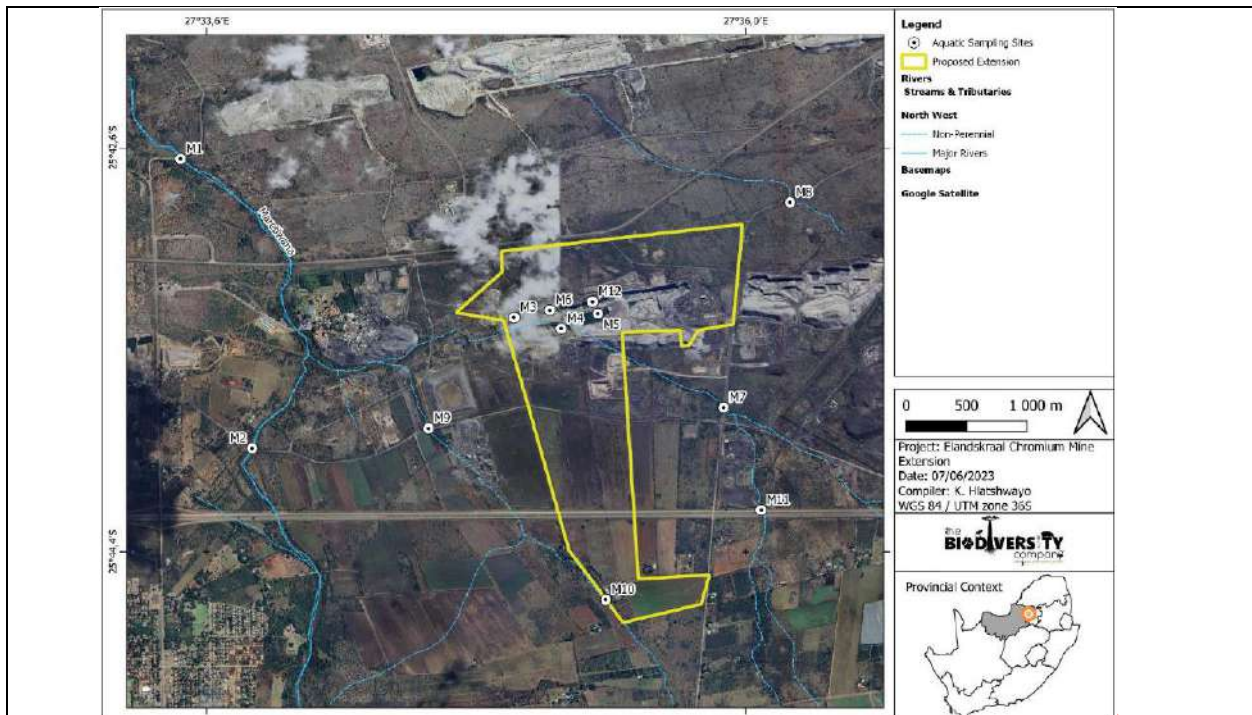






















Figure 13: The location of the proposed mine extension and the assessed aquatic sampling sites.



Table 2: Photos, co-ordinates and descriptions for the sites sampled.

Survey	Upstream View	Downstream View
	<b>M1</b>	
<b>March 2020</b>		
<b>June 2023</b>		
<b>GPS</b>	25°42'38.97"S, 27°33'28.99"E	

		<b>M2</b>	
<b>March 2020</b>			
<b>June 2023</b>			
<b>GPS</b>	<b>25°43'56.33"S, 27°33'48.14"E</b>		
		<b>March 2020</b>	<b>June 2023</b>
<b>M3</b>			
<b>GPS</b>	<b>25°43'21.38"S, 27°34'58.17"E</b>		
<b>M4</b>			
<b>GPS</b>	<b>25°43'24.34"S, 27°35'10.74"E</b>		

<p><b>M5</b></p>		
<p><b>GPS</b></p>	<p>25°43'22.72"S , 27°35'15.80"E</p>	
<p><b>M6</b></p>		
<p><b>GPS</b></p>	<p>25°43'19.42"S, 27°35'7.70"E</p>	
<p><b>M7</b></p>		
<p><b>March 2020</b></p>		
<p><b>June 2023</b></p>		
<p><b>GPS</b></p>	<p>25°43'45.49"S, 27°35'54.11"E</p>	

<b>M8</b>	
<b>March 2020</b>	
<b>June 2023</b>	
<b>GPS</b>	25°42'50.64"S, 27°36'11.95"E
<b>M9</b>	
<b>June 2023</b>	
<b>GPS</b>	25°43'51.02"S, 27°34'35.28"E
<b>M10</b>	
<b>June 2023</b>	
<b>GPS</b>	25°44'36.84"S, 27°35'22.66"E

<b>M11</b>	
<b>June 2023</b>	
<b>GPS</b>	25°44'12.84"S, 27°36'4.10"E
<b>M12</b>	
<b>June 2023</b>	
<b>GPS</b>	25°43'17.18"S, 27°35'19.08"E

**6 Results and Discussion**

**6.1 In situ Water Quality**

*In-situ water quality analysis was conducted during the study. Results have been compared to limits stipulated in the Target Water Quality Range (TWQR) for aquatic ecosystems (DWAf, 1996) and the RQO limits for the Upper Crocodile catchment (DWS, 2019). The results of the March 2020 assessment are presented in Table 7. It should be noted that sites M7, M8, M9, M10, and M11 were dry during the June 2023 survey.*

*Table 7: In-situ surface water quality results (March 2020 and June 2023)*



Site	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/l)	Temperature (°C)
TWQR*	6.5-8.5*	-	>5.00^	5-30*
RQO	-	≤700	-	-
<b>March 2020</b>				
M1	7.1	210	5.3	21
M2	7.0	117	5.1	23
M3	7.6	625	5.2	29
M4	8.3	566	4.6	27
M5	8.5	812	6.5	25
M6	7.7	802	5.6	29
M7	7.7	171	4.2	24
<b>June 2023</b>				
M1	7.4	245	9.8	17.2
M2	7.3	205	9.5	16.2
M3	6.8	1 743	7.7	18.2
M4	7.1	1 272	9.2	18.6
M5	6.6	1 378	10.7	20.7
M6	6.6	1 710	7.7	19.3
M7			DRY	
M8			DRY	
M9			DRY	
M10			DRY	
M11			DRY	
M12	6.5	971	7.7	19.3

\*TWQR – Target Water Quality Range | Levels exceeding guideline levels are indicated in red | ^ Chapman and Kimstach (1996)

The water quality constituents measured during the assessment for the Maretwana River, were all within the acceptable levels when compared to guidelines established by DWAF (1996) and catchment RQO limit. The only exception to this was site M7 which had anoxic condition of 4.2 mg/l which was below the limit prescribed. This was due to the pooling nature of the watercourse and was expected. Stagnant pools of water have low dilution capacity and lack of aeration caused by flow. These pools are also more at risk of eutrophication from algal growth. Site M4 was also anoxic, however sites M3, M4, M5 and M6 are classified as dirty water storage area however are still in the watercourse. Low dissolved oxygen is however expected in storage pools/dams as there is no flow. Water quality results for watercourses associated with chromium mining have pH's which are neutral to alkaline and have high salinity and electrical conductivity (Mavunda., 2016). pH Levels within the Maretwana River and associated tributary therefore coincide with expected levels, however elevated electrical conductivity levels are only found in the PCD's or dirty water dams. No significant water quality changes were observed between the up and downstream monitoring points (M1 and M2). Water quality was therefore not considered to be a hinderance to aquatic organisms within the Maretwana River. However, impacts may be seen in the river when there is flow in the tributary that traverses the MRA.

It is recommended that further water quality assessment is conducted. The assessment of the detailed chemical conditions of associated watercourses is recommended via a monthly monitoring programme.

### 6.2 Intermediate Habitat Integrity Assessment

The condition of the watercourse and associated aquatic biodiversity are largely dependent on the condition and degree of modification of the surrounding catchment.

*The IHIA was completed for the Maretwana River as described in the IHIA methodology component of this study. The spatial framework of which constitutes a 5km reach above and below the proposed mine extension. The results thereof are shown in Table 8.*

The results of the March 2020 and June 2023 IHIA in the Maretswana River indicates largely modified (class D) conditions in both the instream and riparian habitat. Figure 17 illustrates the land use change which has occurred in the receiving environment of the reach in which four mines are present as well as agriculture. These rural activities are a source of water abstraction from the reach with associated runoff/dischARGE as well as associated infrastructure resulting in extensive channel, bed and flow modification within the reach. This includes the use of dams such as seen in Figure 18 which result in inundation of the system. Further, the land use change results in vegetation removal in the competition for land with disturbed land prime for alien invasive vegetation encroachment. The presence of urbanization from Marikana, Elandsdrift and Mooinooi was also expected on the system through domestic use of water resources by residents and altered surface runoff conditions.

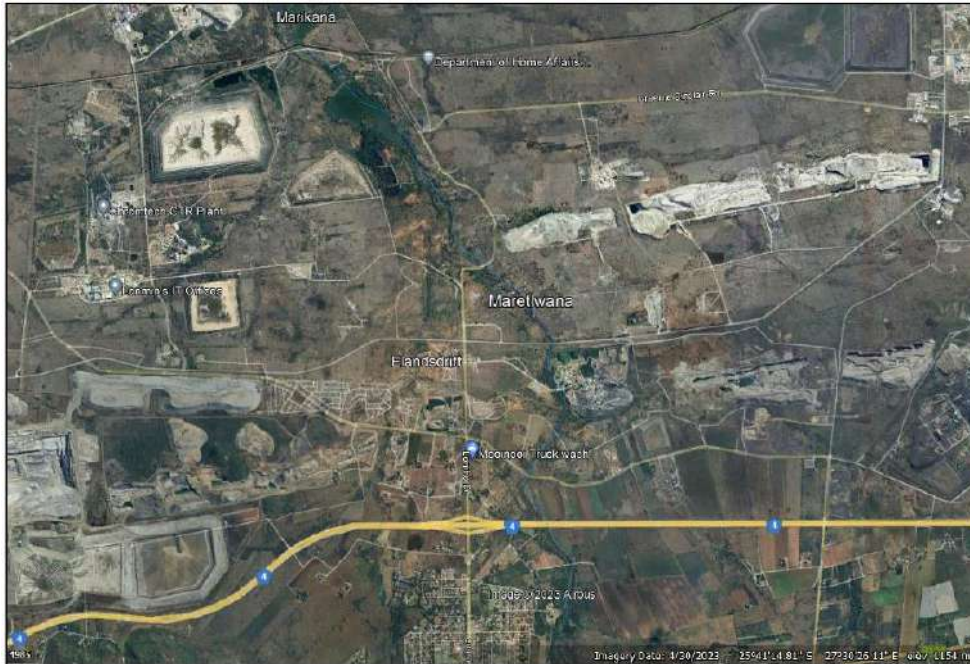


Figure 17: Surrounding land use of the Maretswana River dominated by mining activities, agriculture and infrastructure such as road networks affecting channel morphology (Google Earth, April 2023)

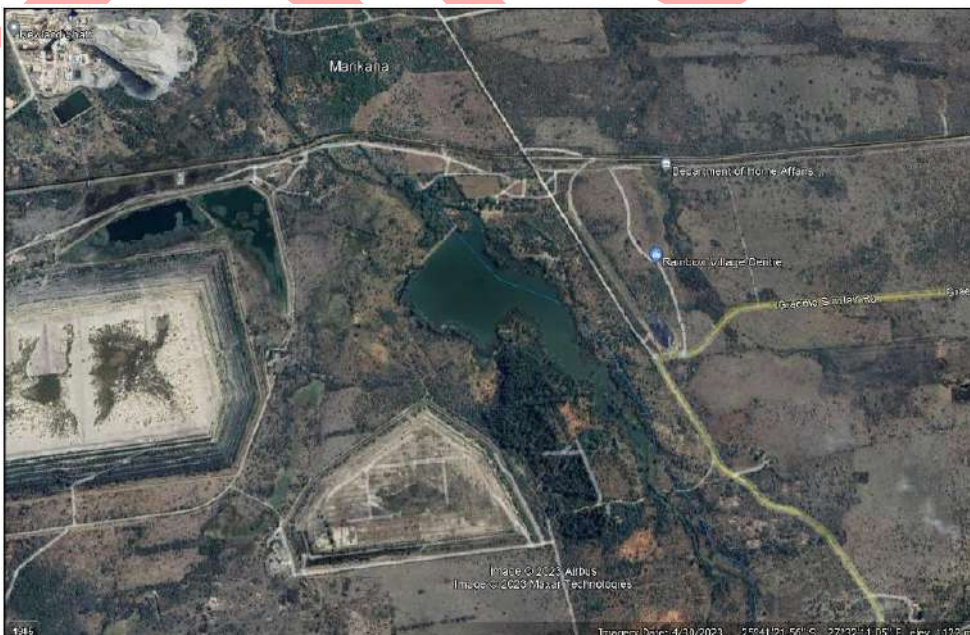


Figure 18: Example of an upstream dam built in the Maretswana River causing inundation (Google Earth, April 2023)

The IHIA was completed for the northern tributary of Maretswana River as described in the IHIA methodology component of this study. The spatial framework of which constitutes a 5km reach above and below the proposed mine extension. The results thereof are shown in Table 9.

The results of the IHIA in the Marelwana River northern tributary indicates largely modified (class D) conditions for instream habitat and critical modification (class E) in riparian habitat. The tributary was dry upstream at M8 with no clear channel, however further downstream condition indicates the flow of water. This could result from mine operations as a discharge creating artificial flow conditions. With the increased rainfall in recent years compared to historic data (2010-2020), this channel is not expected to flow this high in the catchment (M8) (Figure 4). The northern tributary experiences many of the same sources of modification as the Marelwana River, only to a more severe extent. The largest concern in the reach is the opencast mine which has been constructed across the watercourse which has critically affected channel, flow and bed

characteristics and habitat (Figure 19). The proximity of the mine to the watercourse affects water quality with runoff/discharge as well as subsurface flow carry pollutants through the mine downstream. The existing Pollution Control Dams (PCD's) west of Lonmin Shaft are further sources of potential modification to water quality in the case of flooding or dewatering. Further the land use change results in vegetation removal in the competition for land with disturbed land prime for alien invasive vegetation encroachment.

The IHIA was completed for the southern tributary of the Marelwana River as described in the IHIA methodology component of this study. The spatial framework of which constitutes a 5km reach above and below the proposed mine extension. The results thereof are shown in Table 10.

The results of the March 2020 IHIA in the Marelwana River northern tributary indicates largely modified (class D) conditions for instream habitat and critical modification (class E) in riparian habitat. The southern tributary experiences many of the same sources of modification as the Marelwana River, only to a more severe extent. The largest concern in the reach is the Elandskraal Chromium Mine which has been constructed across the watercourse which has critically affected channel, flow and bed characteristics and habitat (Figure 20). Further to this the mine activities are utilizing waste stockpiles within the extent of the watercourse (Figure 21), dispersing potential flows. Alternative drainage were affected by channel modification and water quality modification from the Tailings Storage Facilities (TSF) associated with local mining operations (Figure 22). The proximity of the mine to the watercourse affects water quality with runoff/discharge as well as subsurface flow carry pollutants through the mine downstream. Further the land use change results in vegetation removal in the competition for land with disturbed land prime for alien invasive vegetation encroachment.



Figure 20: All aspects affecting the reach of the Southern tributary of the Marelwana River. Note the development of the Elandskraal Chromium mine directly through the watercourse (Google Earth, March 2020)



Figure 21: Waste stockpiles utilized by the Elandskraal Chromium Mine in the extent of the watercourse (March 2020)



Figure 22: A TSF in the distance within the riparian area of another reach of the tributary (March 2020)

### 6.2.1 Riparian Habitat – Watercourse Extent

Riparian areas have high conservation value and can be considered the most important part of a watershed for a wide range of values and resources. They provide important habitat for a large volume of wildlife and often forage for domestic animals. The vegetation they contain are an important part of the water balance for the hydrological cycle through evapotranspiration. They are crucial for riverbank stability and in preventing erosion within the channel (Elmore and Beschta, 1987). Therefore, they are considered as high priority sensitive areas and should be avoided at all costs, resulting in the assigned 100 m buffer (DWAf, 2005; Macfarlane et al, 2014). According to Regulation 4 of GN R704 of the NWA (no 36 of 1998) no person in control of any mine may develop any residue deposit, dam, reservoir within the 1: 100 year floodline or 100m from any watercourse. The riparian delineations for the Maretswana River and its associated tributaries are presented in Figure 23.

Erosion is very low to moderate. Alien invasive plants occur localised in high densities, especially along the drainage lines.

The riparian communities which dominate Thornvelds are the *Cyperus sexangularis*-*Cynodon dactylon* in perennial or non-perennial rivers. The average species richness is 22 species per relevé of which 32% are alien species. The dominant vegetation species within the riparian areas in Thornvelds are grasses (cover of 50%) such as *Paspalum distichum* and *Bothriochloa bladhii*, *Cynodon dactylon* with some species growing up to 2.2m. The woody component (20% cover) comprised of trees that can reach 6 m in height and also few shrubs. The forb layer is very well developed (40% cover) and species include *Cyperus sexangularis*, *Flaveria bidentis*, *Cyperus esculentus* and *Verbena bonariensis*. Hydrophytic forbs species dominate this stratum. (Mucina & Rutherford., 2006). Declared weeds and invaders include *Achyranthes aspera*, *Sesbania punicea*, *Xanthium strumarium*, *Tithonia rotundifolia*, *Cynodon dactylon* and *Morus nigra* (Henderson, 2001).

The riparian extent observed on site corresponds with the expected vegetation species list. The sampled watercourses were classified as a foothill zonation and as a result have gentle gradients. The plains form extensive grasslands with watercourses forming small depression cutting through the landscape. The riparian vegetation was dominated by grasses 50%, forbs 30% and trees 20% as seen in Figure 24 and Figure 25.

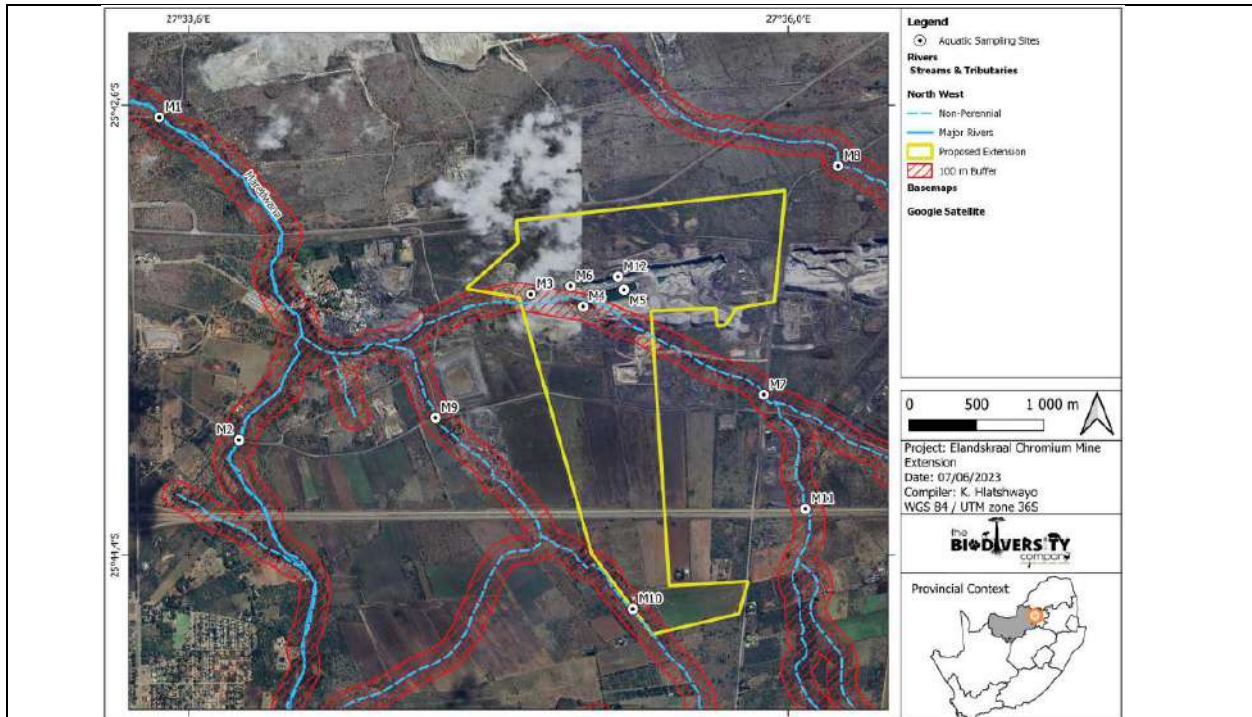


Figure 23: Riparian area delineation 100 m buffer for the Maretswana River as well as accompanied tributary for the project area.



Figure 24: Riparian Area at M2 dominated by grasses and forbs with scattered tree species.



Figure 25: Riparian Area at M1 dominated by tree species overhanging the watercourse. E.g. Combretum erythrophyllum.

### 6.3 Aquatic Macroinvertebrate Assessment

#### 6.3.1.1 Invertebrate Habitat Assessment

The March 2020 and June 2023 surveys indicated that habitat availability was varied throughout the assessed watercourses. Site M6 along the southern tributary had poor habitat availability. This was due to the pooling nature of the tributary removing all habitat within different flow classes as well as all in current habitat. The stones biotope was predominantly absent from the

watercourse which is highly weighted in foothill systems. The low flow in the watercourse limited potential visible habitat within the watercourse which included potential rapids and reed banks which would improve scores. Habitat within the Maretswana River (site M1 and M2) varied between the two sampled sites as a result of river morphology. Habitat availability within the reach ranges from moderate to fair with aquatic vegetation, the only biotope absent. The biotope results within the reach indicate that the habitat availability would be a limiting factor for the macroinvertebrate communities in the associated tributary but not in the Maretswana River.

#### **6.3.1.2 South African Scoring System**

The results of the March 2020 SASS5 invertebrate assessment indicate derived sensitivity scores that ranged from 27 in the tributary to 77 in the Maretswana River. The generated SASS5 scores for the assessed watercourses are therefore categorised as a class E/F at M1 and M6 and class D at M2 which indicates largely to critically modified conditions within the reach (Dallas, 2007). The low number of taxa sampled during the survey are an indication of modification to the system, with available habitat allowing for the presence of intolerant macroinvertebrate families which were absent in the survey. Sampled macroinvertebrate families included tolerant invertebrates such as Oligochaeta, Culicidae, Belostomatidae, Corixidae, Notonectidae, and semi-tolerant invertebrates such as Atyidae, Caenidae, 2 sp. of Hydropsychidae, 3 sp. of Baetidae. There are a number of key families of which habitat could support but were absent as a resultant impact of water quality deterioration within the Maretswana River. The conditions of the tributary were likely influenced by a combination of poor habitat and modified water chemistry indicated by the number of macroinvertebrate families sampled. Without further investigation the cause of modification cannot be identified.

The results of the June 2023 indicated the increase in the sampled macroinvertebrate communities in a downstream direction from M1 to M2. This was attributed to the moderate diversity of instream habitat and the largely natural water quality (measured by in-situ water quality) deemed suitable for sustaining aquatic life. The key indicator taxa present were the 3 species of Baetidae (Mayflies) and Leptophlebiidae (Prongills) to mention a few.

#### **6.3.2 Macroinvertebrate Response Assessment Index**

The results of the MIRAI for the Maretswana River reach and southern tributary associated with the Elandsdraal Chromium Mine extension are provided in Table 13.

The results of the MIRAI derived a class D/E or largely to seriously modified state for the Maretswana River during the March 2020 survey, while highlighting the factors responsible for the presence/absence of taxa within the project area (Table 13). Central factors resulting in a lowered ecological category were attributed to water quality modifications.

Water quality (in-situ) in the Maretswana River was considered largely natural, however water quality related biological responses (sensitive invertebrates) had changed from the derived reference conditions. All of the water quality sensitive taxa expected for the ecoregion under reference conditions were absent from the March 2020 survey. This included taxa with a high and moderate requirement for unmodified water quality. The only taxa present at the time of sampling, were taxa with a low and very low requirement for unmodified water quality (i.e. the most tolerant taxa), confirming poor water quality conditions in the Maretswana River. While in-situ water quality was found to be largely compliant with DWAF (1996) limits, ex-situ chemical analysis was not conducted to investigate the dissolved compounds which have the potential to be lethal to aquatic life.

The calculated MIRAI for the southern tributary indicated class E or seriously modified state. The largest contributor to the absence of expected taxa was the lack of flow in the reach due to its pooling nature. This caused a lack of available habitat. Lastly the water quality was also identified to be a contributor to the absence of expected taxa in the reach.

The MIRAI results for the Maretswana reach indicated a moderately to largely modified (class C/D) macroinvertebrate community in June 2023. This improvement is likely due to improved habitat availability, water quality and flow diversity in 2023 as noted by the improved water quality driver response scores. Despite this improved score, the flow driver still contributes towards a modified community as a few semi common flow dependent taxa were absent (Trichorythidae, Hydropsychidae >2 spp, Elmidae and Psephenidae), while many common taxa were intermittently present across the sites.

Overall, the biological responses represented by the sampled macroinvertebrate assemblages within the Maretswana River, and southern tributary shows impacts directly attributed to existing land use change within the catchment which is affecting water and instream quality.

### **6.4 Ichthyofauna Communities**

#### **6.4.1 Expected Fish Species**

A total of 15 fish species are expected to occur in the Maretswana River reach and associated tributaries which are presented in Table 14. The conservational status of fish species was assessed against the IUCN database 2023 (IUCN, 2023).

The expected species are generated on a reach basis, and the occurrence of all species in the system is unlikely as different species are specialists of different habitats which are present along a reach. The Marelwana River reach does have diversity of habitat and therefore a wide range of fish species are expected although not all species are expected in the associated tributaries. This includes one Vulnerable (V) species and one Near Threatened (NT) species.

Table 14: Expected fish species

Species	Common Name	IUCN Status (2023)
<i>Clarias gariepinus</i>	Sharptooth Catfish / Barbel	LC
<i>Coptodon rendalii</i>	Redbreasted Tilapia	LC
<i>Chiloglanis pretoriae</i>	Shortspine Sucker-mouth	LC
<i>Enteromius paludinosus</i>	Straightfin Barb	LC
<i>Enteromius motebensis</i>	Marico Barb	NT
<i>Enteromius trimaculatus</i>	Threespot Barb	LC
<i>Enteromius unitaeniatus</i>	Longbeard Barb	LC
<i>Labeo cylindricus</i>	African Carp	LC
<i>Labeo molybdinus</i>	Leaden Labeo	LC
<i>Labeobarbus marequensis</i>	Lowveld Largescale Yellowfish	LC
<i>Labeobarbus polylepis</i>	Bushveld Smallscale Yellowfish	LC
<i>Marcusenius pongolensis</i>	Southern Bulldog	LC
<i>Oreochromis mossambicus</i>	Mozambique Tilapia	VU
<i>Pseudocrenilabrus philander</i>	Southern mouth-brooder	LC
<i>Tilapia sparrmanii</i>	Banded Tilapia	LC

LC - Least Concern | NT – Near Threatened | VU – Vulnerable | \*

The results of the qualitative fish community assessment are provided in Table 15. A total of eight (8) fish species fish were observed during both surveys. The most common genus was *Enteromius*, with *Enteromius paludinosus* and *Enteromius trimaculatus* being the most abundant species, present at both sites sampled. While there were three species which were not sampled it is assumed that with increased sampling effort that these species would be sampled due to presence of habitat required by these specialists, sampling was however conducted in accordance with rapid assessments. The Vulnerable species *Oreochromis mossambicus* was sampled from the Marelwana River reach. This species has a very low sensitivity to changes in flow (0.9) and a low sensitivity to physiochemical changes (1.3) in water chemistry with few individuals sampled (Table 15). Two species with moderate sensitivities were sampled (*Enteromius paludinosus* and *Enteromius trimaculatus*) with no species which are highly sensitive to flow of physiochemical change sampled. Care must therefore be taken to limit further modification to the Marelwana River.

Species/Site	March 2020	June 2023	Sensitivity	
			No-flow	Phys-chem
<i>Clarias gariepinus</i>	Yes	Yes	1.7	1
<i>Chiloglanis pretoriae</i>	*	*	4.8	4.5
<i>Coptodon rendalli</i>	*	*	0.9	1.4
<i>Enteromius paludinosus</i>	Yes	Yes	2.3	1.8
<i>Enteromius motebensis</i>	*	*	3.1	
<i>Enteromius trimaculatus</i>	Yes	Yes	2.7	1.8
<i>Enteromius unitaeniatus</i>	*	Yes	2.3	2.2
<i>Labeo cylindricus</i>	*	*	3.1	3.1
<i>Labeo molybdinus</i>	Yes	*	3.3	3.2
<i>Labeobarbus marequensis</i>	*	*	3.2	2.1
<i>Labeobarbus polylepis</i>	*	*	3.1	
<i>Marcusenius pongolensis</i>	*	*	3.0	3.4
<i>Oreochromis mossambicus</i>	Yes	Yes	0.9	1.3
<i>Pseudocrenilabrus philander</i>	*	Yes	1.0	1.4
<i>Tilapia sparmanii</i>	Yes	Yes	0.9	1.4
<b>Total Native Species</b>	<b>6</b>	<b>7</b>		
<b>Total Expected Native Species</b>	<b>15</b>	<b>15</b>	<b>2.42</b>	<b>2.32</b>
<b>% Fish Community Sampled</b>	<b>40</b>	<b>47</b>		

Numbers in the site columns indicate individuals sampled; \* indicates no individuals were sampled

Fish have different sensitivities or levels of tolerance to various aspects that they are subjected to within the aquatic environment. These tolerance levels are rated with a sensitivity score as presented in Table 5. These tolerance levels are scored to show each fish species sensitivity to flow and physico-chemical modifications. The results indicate that fish collected in the Marelwana River are moderately tolerant to changes in flow and changes in flow and tolerant to physico-chemical modification. This applies as an average of the whole class and not each individual species which are seen in Table 15. Further investigation in understanding the Ecological Category of the reach in terms of fish sensitivities requires the use of Fish Response Assessment Index (FRAI), represented in Table 16.

The results of the FRAI derived a FRAI category of (class D) which indicates largely modified fish community structure for the sampled Marelwana River reach. The results need to be analysed with great precaution as the methodology requires multiple sites, with only two selected on the Marelwana River reach (Avenant., 2010). Due to the rapid nature of sampling, there were species which were not collected; however, habitat was present, and the species are expected to be present. Therefore, provided more thorough analysis of the system is suspected to score in a higher class (C). Only 40-47% of the expected fish species were sampled including a vulnerable species sampled (one individual) which indicated good water quality and available habitat, based on its sensitivities to changes in flow and physiochemical properties of a river.

### 6.5 Present Ecological State

The results for the reach based PES assessment (Kleynhans and Louw, 2007) is presented in Table 17.

Table 17: PES of the Marelwana River reach and associated southern tributary.

Aspect assessed	Ecological Score	Ecological Category	Ecological Score	Ecological Category	Ecological Score	Ecological Category
	March 2020				June 2023	
	Marelwana River		Southern Tributary		Marelwana River	
Instream Ecological Category	59.72	D	45.12	D	46.8	D
Riparian Ecological Category	46.60	D	35.64	E	43.8	D
Aquatic Invertebrate Ecological Category	40.40	D/E	33.52	E	58.5	C/D
Fish Ecological Category	51.10	D	*	*	54.8	D
Ecotatus	45.84	D	25.92	E	49.9	D

Every aspect considered in calculating the ecotatus of the Marelwana River reach was found to be largely modified in during March 2020 and June 2023 surveys. The southern tributary has an instream ecological category considered largely modified



*with riparian and aquatic invertebrate ecological categories considered seriously modified. The results of the PES assessment derived a largely modified ecological category for the Maretlwana River reach and a seriously modified ecological category (class E) for the southern tributary. The modified status in both reaches can be attributed to a combination of instream and riparian habitat, flow modification and water quality related drivers. The modification stems from catchment related activities present within the project area, which has impacted aquatic health.*

*The water quality issues presented greatest impacts to this reach with numerous sensitive and semi-tolerant taxa either absent or intermittently present despite the presence of habitat to support most missing taxa. Impacts include the Mooinooi town, Golf Club and associated WWTW in upper reaches, agriculture and mining in the middle reaches, and the Wonderkop residential area, Tecroveer WWTW and mining. These impacts negatively influence the water quality within the Maretlwana together with degradative impacts to the riverine and riparian habitat, through solid waste dumping, excessive algae growth, alien vegetation encroachment, erosion and sedimentation, with the tributaries presenting the greatest level of modification contributing to impacts in the main stem.*

## GROUNDWATER

A Geohydrological investigations was undertaken by Afri GS 95 (Pty) Ltd, the report is available under **Appendix 11**. Please see the findings below:

### **3.8. Aquifer recharge, storage calculations & sustainable aquifer yield**

*Bila Chrome Mine has a surface area of 304 Ha (3 040 000 m<sup>2</sup>); this is the area available for groundwater recharge and storage. Discussed below is the calculated values of annual Recharge (m<sup>3</sup>) and Available Water in Aquifer Storage (m<sup>3</sup>): Recharge = 27.38 mm (0.02738 m) & Storativity = 0.003727 according to GRA II results for quaternary catchment A21K.*

*The calculations for available water in aquifer storage indicate aquifer storage of 289 370.24 m<sup>3</sup>*

*Sustainable aquifer yield calculations indicate an average sustainable yield on the property of 136.82 m<sup>3</sup>/day (i.e 1.58 l/sec).*

*NB: The calculations do not take into account water flowing in from other Quaternary Catchments and current water usage on the mine and surrounding mines and villages.*

### **3.9. Groundwater conceptual modelling**

A conceptual model is an idealised and simplified understanding of the actual physical situation of the study site. The model must however incorporate all the essential features of the system under investigation to enable understanding and prediction within a complex geohydrological and / or geological setting (Sara, 1995).

A site specific conceptual geohydrological model of the investigated area is usually compiled by using site specific geology information gathered from newly drilled boreholes. A basic and simplified conceptual geohydrological model was formulated using available data. The thickness of the saturated zone and depth to bedrock has been determined from GRA II Results for quaternary catchment A21K.

The following conceptual model for the study area can thus be adopted.

Aquifer weathered thickness	23.65 m
Aquifer fractured thickness	140.01 m
Baseflow	18.91 mm
Mean Annual precipitation	651 mm
Static water level	15.81 m bgl
Recharge	27.38 mm

Groundwater is generally expected to flow in a north westerly direction through the study area. The conceptual model is further illustrated in Figure 2 below.

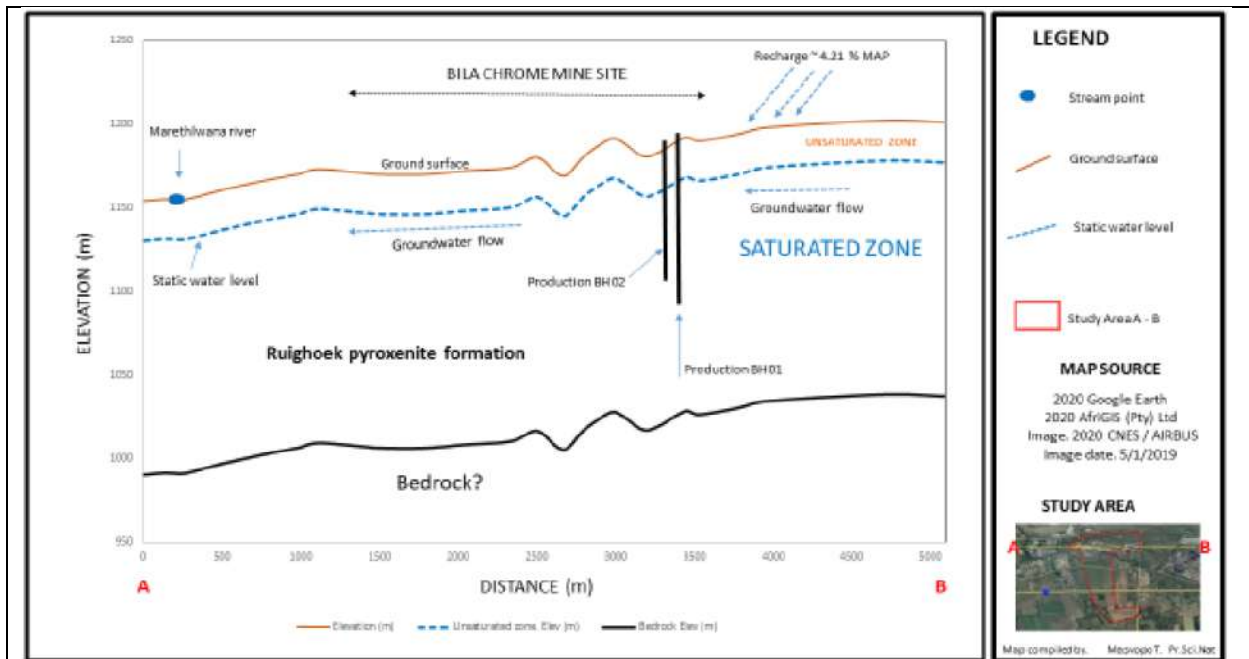


Figure 2. Hydrogeological conceptual model of the study site

### 3.10. Short & long term potential groundwater abstraction impact on existing users

Groundwater abstraction yield estimates as derived from the FC and Cooper Jacob Methods are conservative and as such groundwater drawdown is expected to be between 5 – 10 m at the recommended duty cycles. There is no severe groundwater impact on groundwater levels expected in the immediate vicinity of the Mine. However, further study in the form of a numerical groundwater model is recommended to evaluate long term groundwater potential impacts on groundwater levels and aquifer storage.

### 4.3.2. Groundwater piezometric contour map & flow direction

Groundwater generally flows in a north westerly (NNW) direction through the study area. Groundwater also appears to flow in the direction of the major drainage features within the project area.

Chrome mining & processing activities generally have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range phosphate PO<sub>4</sub><sup>2-</sup> (mg/l), Sulphates PO<sub>4</sub><sup>2-</sup> (mg/l) and Chromium (total) Cr (mg/l). It is thus, recommended, to drill at least two monitoring boreholes. One upstream and the other downstream of the study site. The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa & Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.

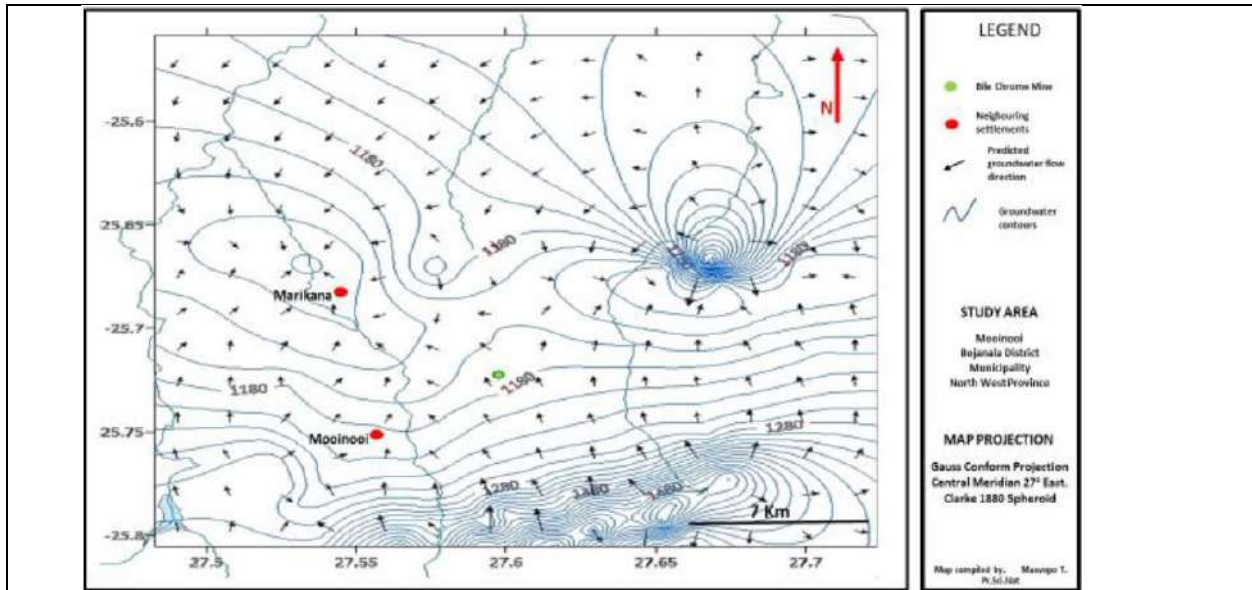


Figure 7. Map showing the piezometric contour map & predicted groundwater flow direction

#### 4.4. Groundwater potential contaminants

The activity of exploiting chromium mines may have significant adverse impacts on the quality indicators of surface water and groundwater, as well as the contamination with chromium element as a result of excavation and excision of chrome ore inside the plant, as well as the rinsing of mineral stocks in storage facilities and sterile wastes loaded with Cr dust. Mining waste water if not treated has the potential of contaminating groundwater & is capable of destroying ecosystems relying on groundwater systems. The water coming out of the mines is usually limestone water, rich in chromium, and if emitted to the environment uncontrollably will flow into surface water or infiltrates through rock fractures into groundwater resources.

Chrome mining & processing activities have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range phosphate PO<sub>4</sub><sup>2-</sup> (mg/l), Sulphates PO<sub>4</sub><sup>2-</sup> (mg/l) and Chromium (total) Cr (mg/l).

#### 4.5. Groundwater quality & monitoring requirements

Baseline groundwater quality for the existing boreholes is as indicated in Table 7. It is also recommended to drill at least two groundwater monitoring boreholes at the locations indicated in Figure 8 below. The proposed downstream borehole will monitor any possible groundwater contamination into neighbouring streams & tributaries. The upstream borehole is considered a control borehole located further away from Mine activities.

Depending on the guidelines of the regulating authority, it is recommended to conduct groundwater level monitoring on a weekly basis. Macro chemical analysis within the project area and within a 1 km zone of the mine, can be conducted after every three months or on a bi-annual basis.



Figure 8. Map showing the proposed groundwater monitoring borehole positions

#### **4.6. Potential Impact on neighbouring streams & groundwater dependent ecosystems**

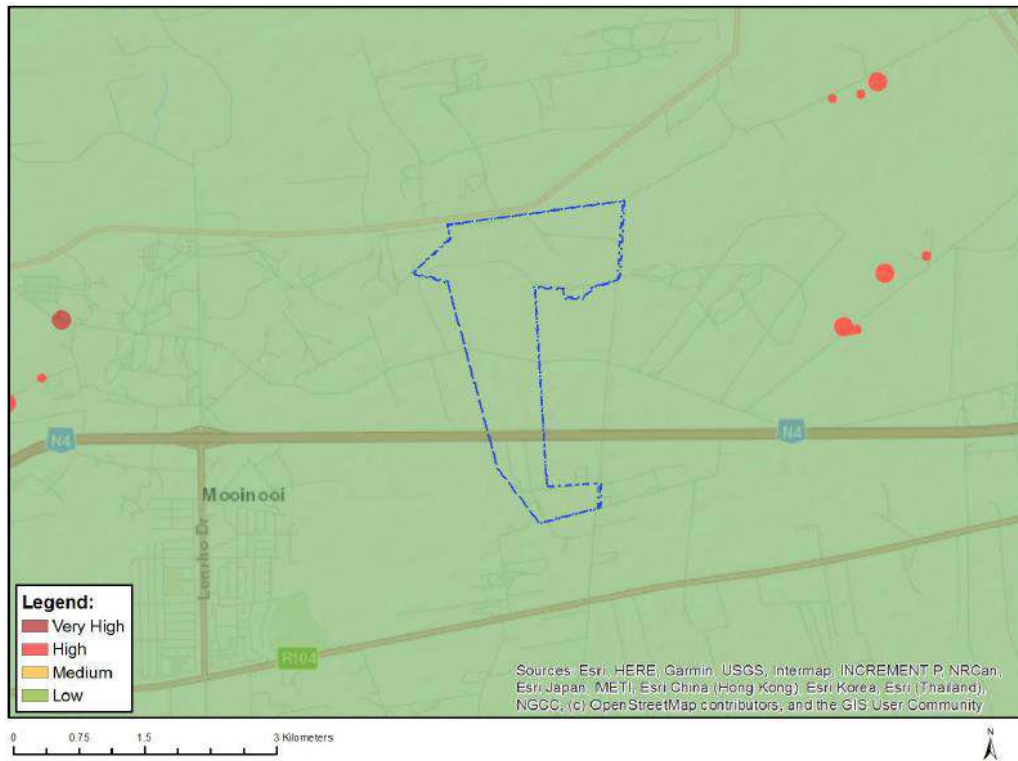
It is recommended to drill at least two monitoring boreholes as per section 4.5. A full chemical analysis should be conducted at these proposed monitoring boreholes to establish baseline water chemistry. Additional testing should be conducted for Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range phosphate PO<sub>4</sub> 2<sup>-</sup> (mg/l), Sulphates PO<sub>4</sub> 2<sup>-</sup> (mg/l) and Chromium (total) Cr (mg/l). Groundwater chemistry over a period of time will determine the potential impact on the environment & serve as an evaluation tool of the waste water treatment efficiency employed by the mine.

#### **5.1. Groundwater Vulnerability**

The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa & Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.

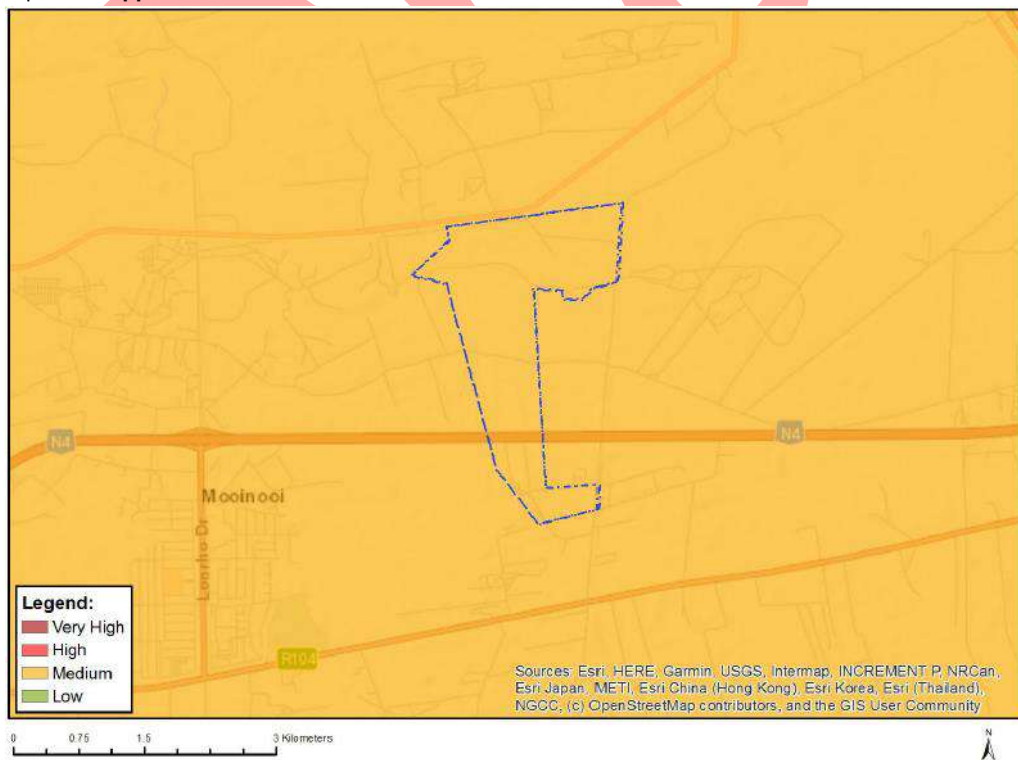
### CULTURAL AND HERITAGE ASPECTS

According to the DFFE Screening Report the proposed area falls within low Archaeological and Cultural Heritage Theme Sensitivity. Please see map colour map under **Appendix 7**.



**Figure 26:** Archaeological and Cultural Heritage Combined Sensitivity

According to the DFFE Screening Report the proposed area falls within Medium Paleontology Theme Sensitivity. Please see map colour map under **Appendix 7**.



**Figure 27:** Relative Paleontology Theme Sensitivity

A Phase 1 Heritage Impact Assessment was conducted by Palaeo Field Services, the report is available under **Appendix 11**. Please see the findings below:

**Locality data**

The study area was divided into three zones for the purpose of the report, which combined, covers approximately 300 ha of relatively flat agricultural land and severely degraded mining areas (Fig. 3).

General Site Coordinates:

Area 1) 25°43'17.95"S 27°35'19.56"E

Area 2) 25°43'59.31"S 27°35'17.35"E

Area 3) 25°44'26.99"S 27°35'24.89"E



Figure 3: Layout of site according to descriptions in report

**Field Assessment**

Area 1 has been impacted by ongoing mining activities, as witnessed by multiple excavation, diggings and overgrown rubble heaps (Fig. 7). Areas 2 and 3 have been altered by ongoing farming activities (Fig. 8 & 9). A foot survey and has indicated no evidence for Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no evidence of Iron Age structures, rock engravings or historical buildings older than 60 years within the study areas. A large cemetery is located near the northern boundary of Area 1 (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E; Fig.10 & 11).



Figure 10: Aerial view of cemetery location in Area 1





Figure 11: Large cemetery with multiple graves dating from the middle of the last century to recent.

### **Impact Statement**

Palaeontologically insignificant Bushveld Complex granites that are capped by superficial (Quaternary) deposits considered to be of low palaeontological sensitivity underlie the study area. The study area is located within a region that is known for rock engraving sites and that bears rich archaeological as well as historical evidence of early migration, fission and subsequent development of early Sotho-Tswana people, leading to the establishment of numerous Iron Age settlements and complexes. However, the field assessment has indicated there is no above-ground evidence of prehistoric structures, historical buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the demarcated area (Table 1). The cemetery is rated Local Significance (Grade 3A). The rest of the development footprint is rated Generally Protected C (GP.C).

### **Recommendations**

According to Section 36(3) of the National Heritage Resources Act 25 of 1999 no person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

It is recommended that the graveyard is included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a 20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities. It will be necessary to ensure that the graveyard is accessible to the relatives of the deceased.

Cultural Heritage in South Africa (includes all heritage resources) is protected by the **National Heritage Resources Act (Act 25 of 1999) (NHRA)**. According to Section 3 of the Act, all Heritage resources include “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

If such resources are found during the mining or development activities, they shall not be disturbed without a permit from the relevant heritage resource Authority, which means that before such sites are disturbed by development it is incumbent on the developer to ensure that a heritage impact assessment is done and the Provincial Heritage Resources Authority and SAHRA must be contacted immediately and work must stop.

If anything of Archaeological and/or paleontological significance is found during the construction and operational phase of the mine the following applies:



- NHRA 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- NHRA 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- NHRA 38(4)e – The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)) so that mitigation can be carry out by a paleontologist.

#### Chance Find Procedure

- If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
- A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.
- Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.
- The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sandbags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

## AIR QUALITY

An Air Quality Impact Assessment (AQIA) was conducted by Rayten Engineering Solutions (Pty) Ltd. The report is available under **Annexure 11**.

The main objective of the Air Quality Impact Assessment (AQIA) is to determine the potential impact of emissions associated with surface operational activities at the proposed mine (at full production) on ambient air quality in terms of dustfall (as Total Suspended Particulates (TSP)) and criteria air pollutants.

As part of the AQIA, a baseline air quality assessment was undertaken to determine the following:

- the prevailing meteorological conditions at the site;
- establish baseline concentrations of key air pollutants of concern;
- identify existing sources of emissions; and
- identify key sensitive receptors surrounding the project site.

Please see some of the findings below: The report is available under **Annexure 11**.

### Listed Activities and Minimum Emission Standards

The NEM: AQA requires all persons undertaking listed activities in terms of Section 21 of the Act to obtain an AEL. The listed activities and associated minimum emission standards were issued by the DEA on 31 March 2010 (Government Gazette No. 33064 of 31 March 2010) and were amended.

Based on the proposed activities, the proposed mine will not trigger any of the activities in terms of Section 21 of NEM:AQA.

South Africa utilises an online National reporting system, referred to as the National Atmospheric Emissions Inventory System (NAEIS). The NEM:AQA requires all emission source groups identified in terms of the National Atmospheric Emission Reporting Regulations (Government Gazette No. 38633 of 02 April 2015), to register and report emissions on the NAEIS. Mines are classified as Group C emitters and thus are required to report annually and comply with the National Atmospheric Emission Reporting Regulations.

Once operational, the proposed Bila Elandskraal Mine must register on the NAEIS and report on their fugitive dust emissions annually before the 31 March each year.

The main conclusions for the Baseline Assessment are as follows:

The project area falls within the Nationally Declared Waterberg-Bojanala Air Quality Priority Area. The land use immediately surrounding the proposed mine consists mostly of cultivated land, grassland and forested land, with few areas consisting of built-up sections, residential areas, shrubland, mines and quarries, wetlands and waterbodies. The larger area surrounding the proposed mine is classified as rural in nature. Existing key sources of airborne emissions surrounding the project site have been identified as follows:

- Agricultural activity (temporary and permanent crops) and potential biomass burning (surrounding areas);
- Planted forest (mostly in the south-eastern quadrant);
- Extraction sites (mainly west, north, and north-east of the proposed mine);
- Vehicle dust entrainment on unpaved roads (surrounding areas); and
- Waste and resource dumps (mostly west, north-west and east of the proposed mine).

MM5 meteorological data for the project area for the period 01 January 2020 – 31 December 2022 was used for input into the dispersion model and to determine prevailing meteorological conditions for the project site. Based on the prevailing wind fields for the period January 2020 to December 2022, emissions from activities at the proposed mine will likely be transported towards the north-westerly wind direction, as evident in the dispersion model output plots in Sections 5.3.1 and 5.3.2. Moderate to fast wind speeds observed during all the time periods, may result in effective dispersion and dilution of emissions from the proposed mine operations; however, higher winds speeds can also facilitate fugitive dust emissions from open exposed areas such as stockpiles and opencast areas. Removal of particulates via wet depositional processes would be evident during the warmer

*(wet) seasons (spring – early autumn) thus lower ambient concentrations of dust could be expected during these seasons. Over the remainder of the year higher ambient concentrations of particulates could be expected.*

*The existing air quality situation was evaluated using available monitoring data for PM10 and PM2.5 from a permanent ambient air quality monitoring station (AQMS) operated near the project site, i.e. at the Marikana AQMS (-25.698444°S; 27.480111°E), which is located approximately 10.25km west-northwest of the proposed mine. The ambient air quality monitoring data covers the period 01 January 2020 – 31 December 2022. The data capture rate at the Marikana AQMS was above average for PM10 and PM2.5, i.e. PM10 (70%) and PM2.5 (70%). Several exceedances, i.e. 384 and 94 exceedances of the PM10 and PM2.5 daily standards of 75 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup>, respectively, were recorded over the monitoring period. Furthermore, PM10 concentrations exceeded the annual standard of 40 µg/m<sup>3</sup> in 2020, 2021 and 2022, while PM2.5 concentrations exceeded the annual standard of 20 µg/m<sup>3</sup> in 2021 and 2022.*

*In terms of the South African National Ambient Air Quality Standards (NAAQS), 4 exceedances of the PM10 24-hour standard are permitted within a calendar year, while no exceedances of the PM10 annual standard are permitted. Additionally, no exceedances of the PM2.5 24-hour and annual standards are permitted within a calendar year. Thus, background PM10 and PM2.5 concentrations at the project site are non-compliant with the South African NAAQS. Baseline dustfall data could not be provided in this AQIA report as there are no available dustfall networks operated near the project site, that could be determined.*

*The main conclusions of the AQIA for the proposed project can be summarised as follows:*

*Dustfall, PM10 and PM2.5 are key pollutants of concern associated with the opencast mining operations at the proposed mine and will be emitted from the following key sources:*

**Dust and Particulate Emissions:**

- *Construction activities (limited to development/expansion of infrastructure to cater for the planned full capacity of operation);*
- *Drilling and blasting at the opencast pit (to break overburden and Run-of-Mine (ROM));*
- *Bulldozing (moving material and shaping stockpiles);*
- *Material handling operations (truck loading/offloading operations);*
- *Conveyor transfer points;*
- *Transportation/hauling of ROM (trucks);*
- *Material storage: Stockpiling;*
- *Crushing and screening;*
- *Excavators and front-end loaders (stripping ore and overburden and loading trucks);*
- *Wind erosion from exposed areas (i.e. exposed surfaces, and material stockpile areas); and*
- *Vehicle dust entrainment on unpaved roads.*

*Based on the dispersion model output plots for the construction phase, predicted incremental dustfall rates and PM (PM10 and PM2.5) concentrations are relatively low and mostly in compliance with the applicable standards over the project area modelled (i.e. the area within the 20m x 20m modelling domain). Higher concentrations, including exceedances of the residential and non-residential area standards of 600 mg/m<sup>2</sup>/day and 1 200 mg/m<sup>2</sup>/day for dustfall, as well as the daily and annual standards of 75 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup> for PM10, respectively, are projected over small areas inside the facility boundary, as well as along a small section of the south-eastern boundary for PM10. For PM2.5, no exceedances of the daily and annual PM2.5 standards of 40 µg/m<sup>3</sup> and 20 µg/m<sup>3</sup>, respectively, are projected.*

*For the operational phase, predicted incremental dustfall rates and PM concentrations are high but mostly in compliance with applicable standards over the project area. For dustfall and annual PM2.5, higher concentrations, including exceedances of the residential and non-residential area standards (for dustfall) and the annual NAAQS (for PM2.5) are projected near the proposed surface mining activities and beyond the proposed mine boundary to the south-west, north-west and south-east, within a 360m radius. Dispersion patterns in predicted annual PM10 and daily PM2.5 concentrations are also similar, with predicted concentrations falling below the applicable NAAQS over most areas surrounding the proposed mine, except at areas north-west and north-east of the proposed mine, where exceedances of the NAAQS are projected up to 930m and 1.4km from the mine boundary for annual PM10 and daily PM2.5, respectively. Predicted daily PM10 concentrations are projected to exceed*

*the applicable limit at all offsite locations surrounding the mine, especially north-west and north-east of the boundary where the exceedances extend up to a maximum radius of 5.3km from the boundary.*

*Based on predicted PM concentrations for the operational phase, which are high and well above applicable limits, the proposed mine is likely to be a significant source of incremental PM10 and PM2.5 concentrations in the area during the operational phase. Since background PM10 and PM2.5 concentrations at the project site are already high, with several exceedances of the daily and annual PM10 and PM2.5 NAAQS recorded over the January 2020 – December 2022 monitoring period at the Marikana AQMS, as seen in Sections 4.2.1 and 4.2.2, the proposed activities will likely result in high cumulative impacts. The proposed mine is also anticipated to be a significant source of incremental dustfall rates during the operational phase due to the high dustfall rates projected from the dispersion modelling exercise. During the construction phase, for which relatively low incremental concentrations are predicted, the proposed mine is not expected to be a significant source of incremental PM10 and PM2.5 concentrations in the area, thus lower cumulative impacts would be expected.*

*Maximum predicted incremental dustfall rates and PM concentrations at all nearby sensitive receptors located within 10km from the proposed mine boundary fall well below the applicable limits for the construction phase. For the operational phase, low predicted incremental dustfall rates and PM concentrations are observed at most of the discrete receptors, except at DR26 (Machadam Combined School), DR27 (Elandsdrift dwellings) and DR28 (Mooinnoi Bokamoso dwellings), which are all downwind of the proposed mining operations, where exceedances of the daily PM10 standard are predicted. Receptors DR26 – DR28 could be at risk since they are potentially already exposed to background emissions released from other nearby mining activities and waste and resource dumps in surrounding areas. Thus, it is recommended that the proposed mine manage and mitigate dustfall emissions associated with proposed surface mining activities as far as possible to minimise the impact on these receptors.*

*Mitigation measures that were considered in this modelling study were limited and included dust suppression using water sprays on all the unpaved haul routes (i.e. route from pit area to ROM stockpile), and moisture content of product material. As dust is the key pollutant of concern associated with activities at the proposed mine, dust suppression should be conducted where possible, to reduce additional levels in background concentrations at the site. In addition, it is recommended that an internal dust management plan be compiled and implemented during the operational phase of the proposed mine. Dustfall monitoring is also recommended prior to commencement of full operations at the mine to determine baseline dustfall rates. The monitoring should be continued during the operational phase.*

*In conclusion the dispersion modelling results indicate relatively low predicted dustfall rates and PM concentrations for the construction phase, with offsite exceedances of applicable standards projected for dustfall and PM10 only. However, the exceedances are restricted to a small section along the south-eastern boundary. For the operational phase, while higher predicted dustfall rates and PM concentrations are predicted, they remain below applicable limits over most of project area. Exceedances projected beyond the proposed mine boundary are more pronounced for daily PM10 concentrations, for which exceedances are predicted over a wider area in surrounding areas, especially towards the north-west and north-east - within a maximum radius of 5.3km. For dustfall and annual PM2.5, non-compliances with applicable limits projected outside the mine boundary are restricted to areas south-west, north-west and south-east of the proposed mine, within a 360m radius; for annual PM10 and daily PM2.5, exceedances at offsite locations are restricted to areas north-west and north-east of the boundary, within maximum radii of 930m and 1.4km, respectively.*

*Based on the above information, Rayten believes the commencement of full mining operations at the proposed Bila Elandskraal mine can go ahead if the dust mitigation measures recommended in this AQIAr are strictly implemented as much as possible, where feasible, in order to reduce dust emissions at the proposed mine. Emissions associated with the proposed mine are predicted to have a low to medium negative impact on air quality if mitigation measures are implemented, with no fatal flaws identified after the implementation of mitigation measures.*

## Air quality health effect

An Air Quality Impact Assessment (AQIA) was conducted by Rayten Engineering Solutions (Pty) Ltd. The report is available under **Annexure 11**. Please see the findings below:

### **3.7. Human Health Effects (Dustfall and Particulates)**

#### **3.7.1. Dustfall**

Dustfall are particles with an aerodynamic diameter greater than 20  $\mu\text{m}$  that have been entrained into the air by a physical process such as wind, movement of vehicles, stack emissions or from fugitive dust. These particles are generally too heavy to remain in suspension in the air for any period and fall out of the air over a relatively short distance depending on a combination of various factors such as particle size, density, temperature (of the air and particle), emission velocity or method, ambient wind speed and humidity. These particles are therefore commonly known as “dustfall”. Particulates in this range are generally classified as a nuisance dust and can cause physical damage to property and physical irritation to plants, animals and humans.

#### **3.7.2. Particulates (PM10 & PM2.5)**

Particles can be classified by their aerodynamic properties into coarse particles, PM10 (particulate matter with an aerodynamic diameter equal to or less than 10  $\mu\text{m}$ ) and fine particles, PM2.5 (particulate matter with an aerodynamic diameter equal to or less than 2.5  $\mu\text{m}$ ). The fine particles mostly contain secondary formed aerosols such as sulphates and nitrates, combustion particles and re-condensed organic and metal vapours. The coarse particles mostly contain earth crust materials and fugitive dust from roads and industries (Harrison and van Grieken, 1998) (Fenger, 2002).

In terms of health impacts, particulate air pollution is associated with effects on the respiratory system (WHO, 2000). When looking at human health particle size is an important factor to consider because it controls where in the respiratory system a given particle will be deposited. Fine particles are thought to be more damaging to human health than coarse particles as larger particles do not penetrate deep into the lungs compared to smaller particles. Larger particles are deposited into the extra thoracic part of the respiratory tract while smaller particles are deposited into smaller airways that lead to the respiratory bronchioles (WHO, 2000).

Previous studies suggest that short-term exposure to particulate matter leads to adverse health effects, even at low concentrations of exposure (below 100  $\mu\text{g}/\text{m}^3$ ). Morbidity effects associated with short-term exposure to particulates include increases in lower respiratory symptoms, medication use and small reductions in lung function. Long-term exposure to low concentrations (~10  $\mu\text{g}/\text{m}^3$ ) of particulates is associated with mortality and other chronic effects such as increased rates of bronchitis and reduced lung function (WHO, 2000). Those most at risk include the elderly, individuals with pre-existing heart or lung disease, asthmatics and children.

## SENSITIVITY OF PROJECT

A Blast Impact Assessment was conducted by Blast Management & Consulting, the report is available under **Appendix 11**.

The study identified 234 Point of Interests (POI) which includes various structures ranging from well-built structures to informal building styles. The table with the list of POI identified (Table 6) are not included in the findings table below, but it is available in the specialist report under Annexure 11.

Please see some of the specialist findings below:

### **11. Sensitivity of Project**

A review of the project and the surrounding areas is done before any specific analysis is undertaken and sensitivity mapping is done, based on typical areas and distance from the proposed mining area. This sensitivity map uses distances normally associated where possible influences may occur and where influence is expected to be very low or none. Three different areas were identified in this regard:

- A highly sensitive area of 500 m around the mining area. Normally, this 500 m area is considered an area that should be cleared of all people and animals prior to blasting. Levels of ground vibration and air blast are also expected to be higher closer to the pit area.

- An area 500 m to 1500 m around the pit area can be considered as being a medium sensitive area. In this area, the possibility of impact is still expected, but it is lower. The expected level of influence may be low, but there may still be reason for concern, as levels could be low enough not to cause structural damage but still upset people.
- An area greater than 1500 m is considered low sensitivity area. In this area, it is relatively certain that influences will be low with low possibility of damages and limited possibility to upset people.

Figure 3 shows the sensitivity mapping with the identified points of interest (POI) in the surrounding areas for the proposed project area. The specific influences will be determined through the work done for this project in this report.

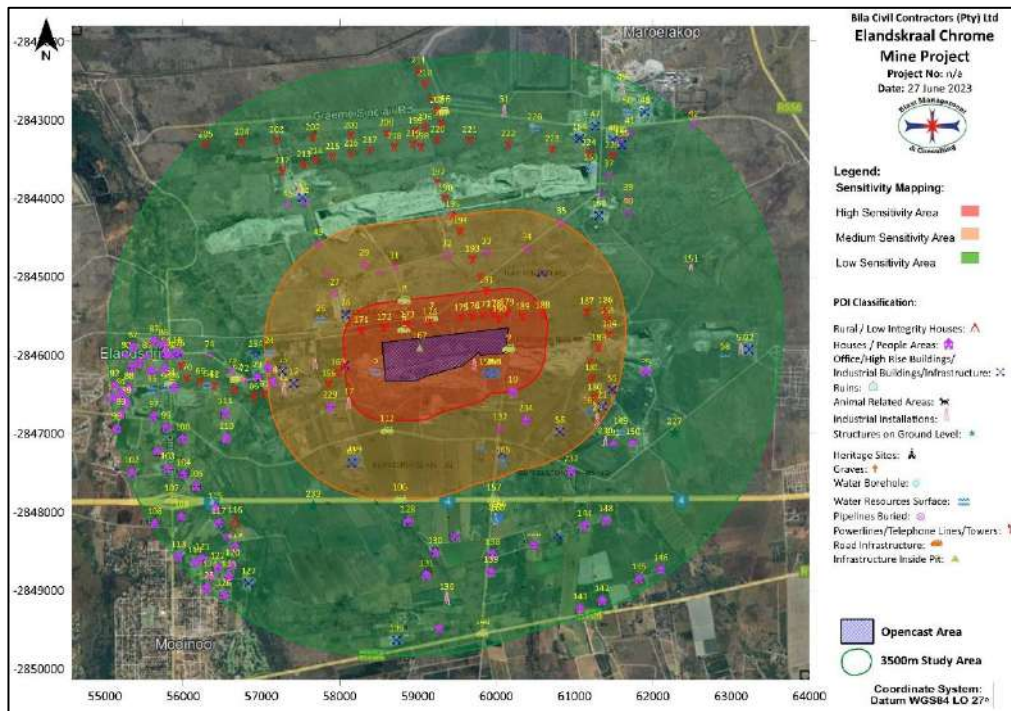


Figure 3: Identified sensitive areas

#### 14. Baseline Structure Profile

All possible structures in a possible influence area are identified.

A list was prepared of all structures in the vicinity of the open pit area. The list includes structures and Point of Interest (POI) within the 3500 m boundary – see Table 6 below. A list of structure locations was required to determine the allowable ground vibration limits and air blast limits. Figure 3 shows an aerial view of the planned open pit area and surroundings with POIs.

#### 17.2 Summary of ground vibration levels

The opencast operations were evaluated for expected levels of ground vibration from future blasting operations. Review of the site and the surrounding installations / houses / buildings showed that structures vary in distances from the pit area. The influences will also vary with distance from the pit area. The model used for evaluation does indicate significant levels. It will be imperative to ensure that a monitoring program is done to confirm levels of ground vibration to ensure that ground vibration levels are not exceeded.

The evaluation considered a distance up to 3500 m from the pit area. The closest structures observed are the Road, Mine Buildings/Structures, Hydrocencus, Dam and Power Lines/Pylons. The ground vibration levels predicted for all POI's evaluated ranged between 0.4 mm/s and 788.0 mm/s for structures surrounding the open pit area.

The distances between structures and the pit areas are a contributing factor to the levels of ground vibration expected and the subsequent possible influences. It is observed that for the different charge masses evaluated those levels of ground vibration will change as well. In view of the minimum and maximum charge specific attention will need to be given to specific areas. The

*minimum charge used indicated three POI's of concern and the maximum charge indicated seven POI's of concern in relation to possible structural damage or where levels is expected to exceed the ground vibration limits.*

*On a human perception scale eleven POI's were identified where vibration levels may be perceptible and lower for the minimum charge and one twenty-five POI's for the maximum charge. Two POI's were identified where vibration levels may be unpleasant and intolerable for the minimum charge and five POI's for the maximum charge. Perceptible levels of vibration may be experienced up to 2455 m and unpleasant up to 826 m and intolerable up to 469m. Problematic levels of ground vibration – levels greater than the proposed limit – are expected up to 874 m from the pit edge for the maximum charge. Any blast operations further away from the boundary will have lesser influence on these points.*

*The nearest public structures are located 503 m from the pit boundary. Ground vibration level predicted at this building where people may be present is within the limits for the maximum charge but could lead to complaints. In view of this specific mitigations will be required.*

*Structure conditions ranged from industrial construction to poor condition structures.*

*There are thirteen water boreholes identified within the mining rights area and it is uncertain what the long-term plan will be for these boreholes. A mitigation plan will be required to determine if these boreholes will be retained or replaced.*

*Mitigation of ground vibration was considered and discussed in Section 18.3. A detail inspection of the area and accurate identification of structures will also need to be done to ensure the levels of ground vibration allowable and limit to be applied.*

### **17.3 Ground Vibration and human perception**

*Considering the effect of ground vibration with regards to human perception, vibration levels calculated were applied to an average of 30Hz frequency and plotted with expected human perceptions on the safe blasting criteria graph (see Figure 12 below). The frequency range selected is the expected average range for frequencies that will be measured for ground vibration when blasting is done. Based on the maximum charge and ground vibration predicted over distance it can be seen from Figure 12 that up to a distance of 2455 m people may experience levels of ground vibration as perceptible. At 826 m and closer the perception of ground vibration could be unpleasant. Closer than 469 m the levels will be intolerable and generally greater than limits applied for structures in the areas.*

### **17.4 Potential that vibration will upset adjacent communities**

*Ground vibration and air blast generally upset people living in the vicinity of mining operations. The nearest buildings/structures (POI 10) are approximately 503 m from the planned operation. These buildings are located such that levels of ground vibration predicted from minimum charge may be perceptible and could lead to complaints. Charge mass per delay greater than minimum charge will show increased levels of ground vibration and higher probability of damage.*

*Ground vibration levels expected from maximum charge has possibility to be perceptible up to 2455 m. It is certain that lesser charges will reduce this distance for instance at minimum charge this distance is expected to be 1296 m. The anticipated ground vibration levels are certain to have possibility of upsetting any households within these ranges.*

*The importance of good public relations cannot be over emphasised. People tend to react negatively on experiencing of effects from blasting such as ground vibration and air blast. Even at low levels when damage to structures is out of the question it may upset people. Proper and appropriate communication with neighbours about blasting, monitoring and actions done for proper control will be required.*

### **17.5 Cracking of houses and consequent devaluation**

*The structures found in the areas of concern ranges from informal building style to brick, mortar structures and steel structures. There are various buildings found within the 3500 m range from the mining area. Building style and materials will certainly contribute to additional cracking apart from influences such as blasting operations.*

*The presence of general vertical cracks, horizontal and diagonal cracks that are found in all structures does not need to indicate devaluation due to blasting operations but rather devaluation due to construction, building material, age, standards of building*

*applied. Thus, damage in the form of cracks will be present. Exact costing of devaluation for normal cracks observed is difficult to estimate. Mining operations may not have influence to change the status quo of any property if correct precautions are considered.*

*The proposed limits as applied in this document i.e. 6 mm/s, 12.5 mm/s and 25 mm/s are considered sufficient to ensure that additional damage is not introduced to the different categories of structures. It is expected that, should levels of ground vibration be maintained within these limits, the possibility of inducing damage is limited.*

#### **17.7. Summary of findings for air blast**

*Review of the air blast levels predicted for the maximum charge ranges between 120.5 and 144.1 dB for all the POI's considered. This includes the nearest points such as the Mine Buildings/Structures. These levels may contribute to effects such as rattling of roofs or door or windows with limited points that are expected to be damaging and that could lead to complaints.*

*Minimum charge predictions identified that thirty-five POI's at the pit area could experience levels of air blast that could lead to complaints. Maximum charge predictions indicate that ninety-three POI's at the pit area could experience air blast that could lead to complaints. There are two POI's for minimum charge and two POI's identified for maximum charge where air blast levels are greater than the limits applied and possible contribution to damage.*

*The current accepted limit on air blast is 134 dBL. Damages are only expected to occur at levels greater than 134 dBL. Prediction shows that air blast will be greater than 134 dB at distance of 390 m and closer to pit boundary. Infrastructure at the pit area such as roads and power lines/pylons are present, but air blast does not have any influence on these installations.*

*The possible negative effects from air blast are expected to be the same than that of ground vibration. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pit is located such that "free blasting" – meaning no controls on blast preparation – will not be possible. The effect of stemming control will need to be considered. In many cases the lack of proper control on stemming material and length contributes mostly to complaints from neighbours.*

#### **17.8 Fly-rock unsafe zone**

*The occurrence of fly rock in any form will have a negative impact if found to travel outside the unsafe zone. This unsafe zone may be anything between 10 m or 1000 m. A general unsafe zone applied by most mines is normally considered to be within a radius of 500 m from the blast; but needs to be qualified and determined as best possible.*

*Calculations are also used to help and assist determining safe distances. A safe distance from blasting is calculated following rules and guidelines from the International Society of Explosives Engineers (ISEE) Blasters Handbook. Using this calculation, the minimum safe distances can be determined that should be cleared of people, animals and equipment. Figure 15 shows the results from the ISEE calculations for fly rock range based on a 140 mm diameter blast hole and 2.5 m stemming length. Based on these values a possible fly rock range with a safety factor of 2 was calculated to be 493 m. The absolute minimum unsafe zone is then the 493 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded. Best practices should be implemented at all times. The occurrence of fly rock can be mitigated but the possibility of the occurrence thereof can never be eliminated. Figure 16 shows the area around the Pit area that incorporates the 493 m unsafe zone.*



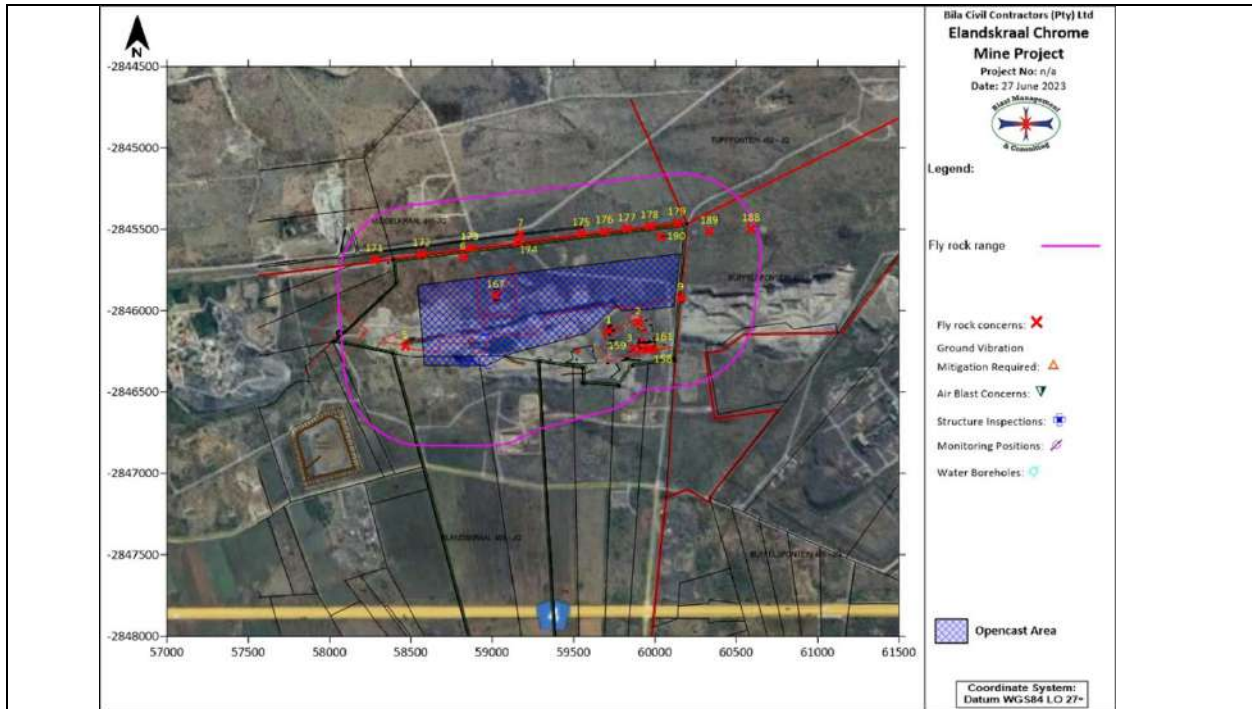


Figure 16: Predicted Fly Rock Exclusion Zone for the Pit area

Review of the calculated unsafe zone showed twenty-three POI's for the Pit area (including POI's inside the pit area at this stage) are within the unsafe zone. Table 14 below shows the POI's of concern and coordinates.

Table 14: Fly rock concern POI's

Tag	Description	Y	X
1	Mine Activity	-59716.40	2846126.49
2	Mine Buildings/Structures	-59898.08	2846071.39
3	Mine Buildings/Structures	-59925.71	2846232.88
5	Dam	-58463.23	2846219.33
6	Road	-58820.94	2845673.31
7	Road	-59173.82	2845530.42
9	Road	-60159.72	2845922.17
158	Hydrocensus (BH 01)	-59965.15	2846233.65
159	Hydrocensus (BH 02)	-59866.57	2846238.18
161	Hydrocensus (2 Boreholes)	-59984.42	2846233.51
167	Heritage (Graves) - Inside Pit Area	-59021.93	2845906.10
171	Power Lines/Pylons	-58274.98	2845685.37
172	Power Lines/Pylons	-58567.43	2845651.49
173	Power Lines/Pylons	-58862.54	2845614.68
174	Power Lines/Pylons	-59153.66	2845578.27
175	Power Lines/Pylons	-59548.60	2845525.84
176	Power Lines/Pylons	-59689.58	2845510.47
177	Power Lines/Pylons	-59828.80	2845496.94
178	Power Lines/Pylons	-59968.57	2845480.06
179	Power Lines/Pylons	-60135.12	2845459.88
188	Power Lines/Pylons	-60592.63	2845497.24
189	Power Lines/Pylons	-60335.10	2845514.24
190	Power Lines/Pylons	-60036.04	2845546.75

### 17.9 Noxious fumes

The occurrence of fumes in the form the NOx gas is not a given and very dependent on various factors as discussed in Section 13.6. However, the occurrence of fumes should be closely monitored. Furthermore, nothing can be stated as to fume dispersal to nearby farmsteads, but if anybody is present in the path of the fume cloud it could be problematic.

### 17.10 Water Borehole Influence

Location of boreholes for water was evaluated for possible influence from blasting. Hydrocensus boreholes were identified within the influence area at the Pit areas. There are boreholes that are in close proximity of the blasting areas but are not of any ground vibration concern. Table 15 shows all the identified boreholes. Figure 17 shows the location of the boreholes in the area.

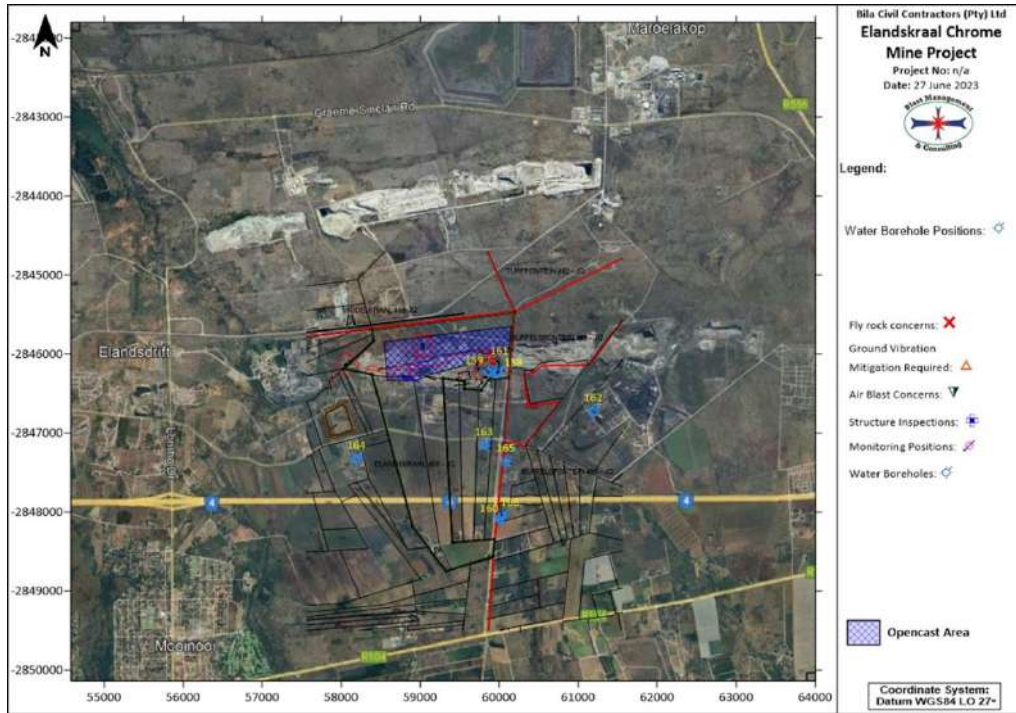


Figure 17: Location of the Boreholes

### 17.11 Samancor Western Chrome Mines Underground Workings

Underground workings for the Samancor Western Chrome Mines group are present on the northern side of the planned opencast areas. The following Figure 18 shows location of the underground workings. Blasting on surface will require consideration of the underground operations. The exact depth below surface nor if this active mining area is not known at this stage. Air blast and fly rock is not considered for impact on underground workings.

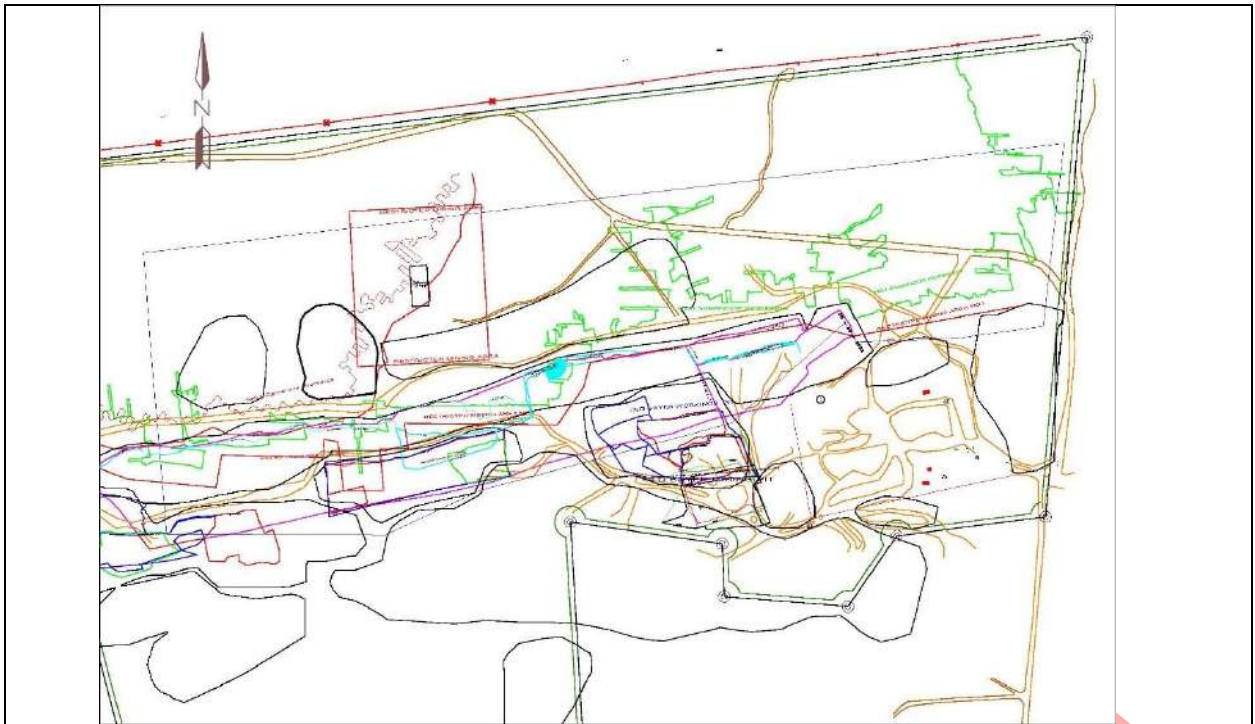


Figure 18: Location of Samancor underground workings

On discussion with Elandsdraal Chrome Mine management it was indicated that mining on surface will be restricted to areas 50 m horizontally from the underground workings. Figure 19 shows simplified layout of restricted area and underground workings.

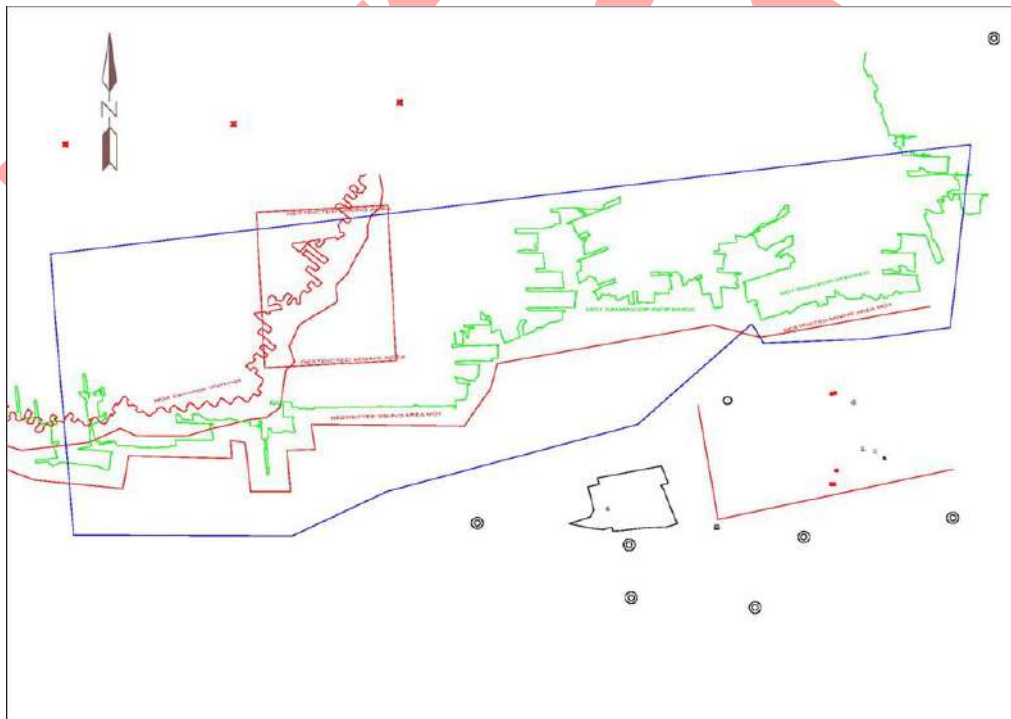


Figure 19: Simplified plan of underground workings

Considering that mainly MG4 will be mined in close proximity of the underground workings the depths below the MG4 needs to be established. There is unfortunately now specific depths of the underground workings available. The Mine Works Plan (MWP) indicated that the MG4 bottom of reef to the top of the MG2 is 26.06 m. The following Figure 20 from the MWP substantiates

the depth levels. Based on the 50 m horizontal and Bottom of MG4 a shortest direct distance between possible blasting and the underground workings is 56.35 m.

Similar conditions of surface mining in close proximity to underground workings are found almost everywhere when outcrop layers are being mined for the chromite environment and Platinum Group Metals environment. On a another site with similar situation a limit for ground vibration was established at 150 mm/s. During the excavation of the opencast the limits was adhered too and the crown pillar respected. In this case the crown pillar will be 50 m.

Prediction of expected levels of ground vibration for effect underground is similar to that of surface blasting except that the surface waves – which is one component of the wave type generated from blasting – does not manifest in this situation. Ground vibration consists of surface waves and body waves. Body waves consist of compressional and shear waves. The amplitude of body waves is relatively halve that of surface waves. Thus, scaled distance prediction of ground vibration for the effect of surface blasting on underground is done but the result halved.

Using the scaled distance prediction the expected levels at the underground operations can then be predicted and the following Table 16 shows expected ground vibration levels for specific distances.

Table 16: Ground Vibration Levels Underground

Distance (m)	Min. Charge per Delay (268 kg) PPV (mm/s)	Max. Charge per Delay (810 kg) PPV (mm/s)
56.0	75.1	187.1
60.0	67.0	166.9
80.0	41.7	103.9
100.0	28.9	71.9
120.0	21.4	53.2
140.0	16.6	41.2
160.0	13.3	33.1
180.0	10.9	27.2
200.0	9.2	22.9
220.0	7.9	19.6
240.0	6.8	16.9
260.0	6.0	14.9
280.0	5.3	13.1
300.0	4.7	11.7

Review of the predictions made it is clear that 50 m (horizontal) from the underground workings the maximum charge will exceed allowed limits closer than 80 m. The minimum charge – single hole firing can be allowed up to the 50 m boundary.

It is clear that a minimum of 50 m boundary must be maintained between the surface blasting and the underground blasting operations and a maximum of 620 kg can be allowed safely. At 56 m 620 kg is expected to yield 150 mm/s. However it is recommended that single hole firing is maintained when blasting next to the underground workings.

Blasting next to the underground workings will be restricted and requires careful planning with execution.

## DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT

### Madibeng Local Municipality

#### **PRIMARY ECONOMY**

Agriculture, tourism and mining are the main primary economies. The Agricultural sector, which produces food, is the biggest primary economy. It is categorized into four classifications, namely, extensive farming (44% of the Municipal area), intensive agriculture (18%), game farming (10%) and subsistence farming. Tourism also plays a major economic role as it is based on the natural systems (11%). Scenic routes, heritage sites, resorts and nature reserves are some of the main attractions in the tourism sector.

The mining sector is dominated by platinum and chromium mining as well as quarrying activity. Platinum mining activity is located on the southeastern side of the side of Brits while quarrying is spread around the municipal area. The primary economic activities have to be managed in such a manner as to make sure that their impact on the natural environment and resources is controlled.

#### **SECONDARY ECONOMY**

Secondary economy refers to activities involved in the manufacturing of finished goods. The secondary sector is understood to include all manufacturing, processing, and construction. Activities associated with the secondary economy include metal working, smelting, automobile production, textile production, chemical industries, engineering industries, manufacturing, energy utilities, breweries, bottlers, and construction.

Secondary economic activities are normally linked to the primary economic activity. Thus, secondary activity in Madibeng Local Municipality is in alignment with agricultural processing without the exclusion of manufacturing and construction. These activities are located in Brits, along the N4 Highway as well as a lesser activity scale in Lethlabile.

#### **TERTIARY ECONOMY**

The tertiary sector of the economy is largely associated with service industries. This sector provides services to both the general population and businesses. Activities that are commonly associated with tertiary economy include retail and wholesale sales, transportation, distribution, entertainment, restaurants, clerical services, media, tourism, insurance, banking, healthcare and law.

In most developed and developing countries, a growing proportion of workers are devoted to the tertiary sector. The N4 Highway plays a significant role within the transport, logistics and distribution activities within the municipal area. The N4 facilitates transport linkages between Rustenburg, Tshwane and Johannesburg.

Brits is the administrative capital of the municipality, bearing the bulk of municipal and government services. The Pelindaba nuclear facility also forms part of the government services. It is located on the southeastern side on the municipal area.

#### **DEMOGRAPHIC INDICATORS**

The ability of individuals to contribute to production is largely dependent on their level of human capital development. This level of development is indicated by demographic indicators such as education, housing, employment and income levels.

Education and formal training play an important role in the overall value of people. Increased value of Madibeng Local Municipality's residents can improve their living conditions. Further Education Training (FET) colleges, which concentrate on economic sectors present in the Municipality, will improve the human capital in Madibeng. This will reduce unemployment rate in the Municipality.

#### **RURAL DEVELOPMENT**

The northeastern quadrant of the Municipality is composed of rural settlements (villages). These villages are characterised by subsistence farming and indigenous knowledge systems. Rural development can be assessed by investigating rural livelihoods, access to income, access to land and access to services. This will inform the manner in which basic services are provided and the rural landscape is retained.

Rural areas are characterized by relatively high logistical costs and high per capita service costs. Therefore, the provision of government services such as the municipal office, clinic, schools, become costly. Thus, in cases where services are provided, the recurrent costs of all but the most basic services must be met by those who use them. It is essential for Madibeng to recover costs in the peri-urban and rural areas through the pro-active debt collection policies.

The process of formalising settlements in rural areas is essential. This process helps to unlock the economic potential of the area, facilitate appropriate regulation of land use as well as enable the municipality to implement cost recovery. This will ensure sustainable rural settlements.

**Department of Statistics South Africa**

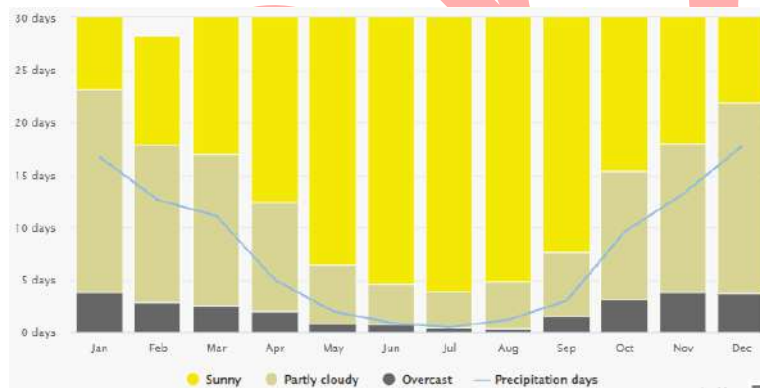
According to the 2011 Stats SA census data for the municipality the Unemployment rate is 30,4% and the Youth unemployment rate is 38.2%.

**CLIMATE: MOOINOOI**

The meteoblue climate diagrams are based on 30 years of hourly weather model simulations and available for every place on Earth. They give good indications of typical climate patterns and expected conditions (temperature, precipitation, sunshine and wind). The simulated weather data have a spatial resolution of approximately 30 km and may not reproduce all local weather effects, such as thunderstorms, local winds, or tornadoes, and local differences as they occur in urban, mountainous, or coastal areas.

**Average temperatures and precipitation**

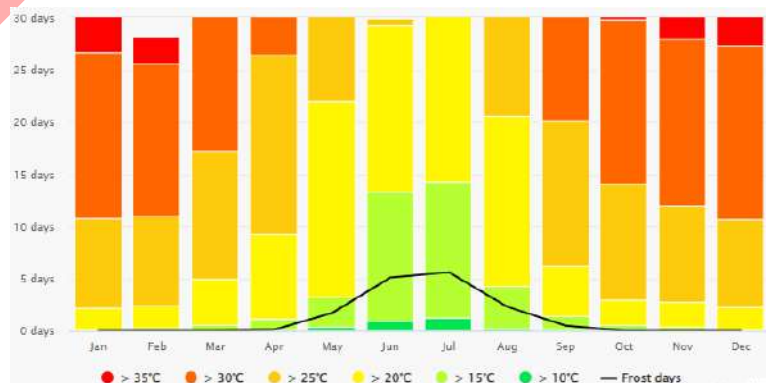
The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Mooinooi. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years

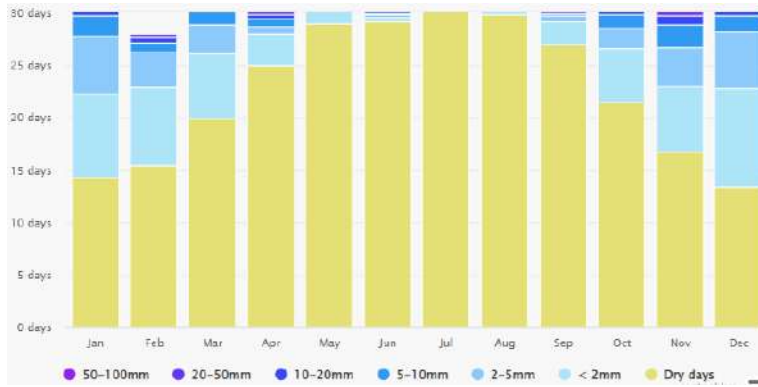


Cloudy, sunny, and precipitation days

**Maximum temperatures**

The maximum temperature diagram for Mooinooi displays how many days per month reach certain temperatures.



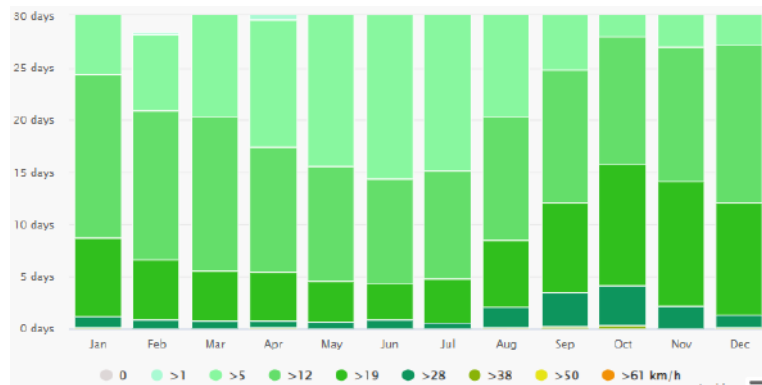


**Precipitation amounts**

The precipitation diagram for Mooinooi shows on how many days per month, certain precipitation amounts are reached.

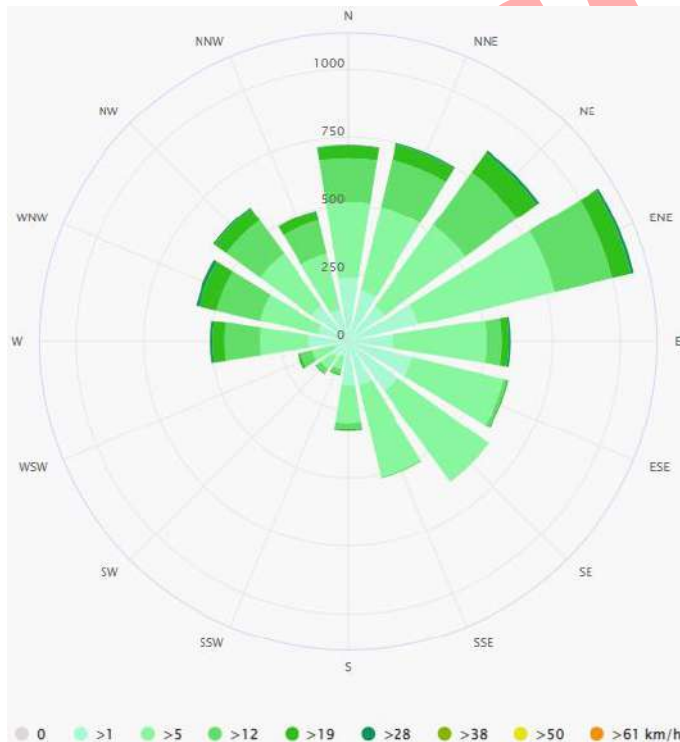
**Wind speed**

The diagram for Mooinooi shows the days per month, during which the wind reaches a certain speed.



**Wind rose**

The wind rose for Mooinooi shows how many hours per year the wind blows from the indicated direction



The data is derived from: [https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/brits\\_republic-of-south-africa\\_1015621](https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/brits_republic-of-south-africa_1015621)

**DESCRIPTION OF THE CURRENT LAND USES.**

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102).

According to the maps below (Figure 28 and Figure 29), the proposed area is largely covered by cultivation, natural vegetation, degraded land and mining.

As mentioned above the applicant has an existing Prospecting Right on the proposed area and the area identified as natural vegetation on the land use and land cover maps below is currently disturbed by the mining activities, please see google earth map (Figure 30).

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under Appendix 11. Please see the findings below:

*The area is heavily disturbed by current prospecting activities on the northern part of the application area. Over the northern part of the application area there are mining related infrastructure, such as a workshop area, fence lines, mine roads and access roads to the prospecting area, dumps of various sizes and purposes, quarries and excavations. The central and southern part of the project area is currently utilised as agricultural land with cultivated fields and citrus orchards.*

An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under Appendix 11. Please see the findings below:

*“the majority of the current land use of the land should be adjusted to reflect MINING ACTIVITIES (old and new) on a major disturbed area of 188 ha. The rest of the application area covers an surface area (area 1 &2) that is used for AGRICULTURAL ACTIVITIES . The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural).*

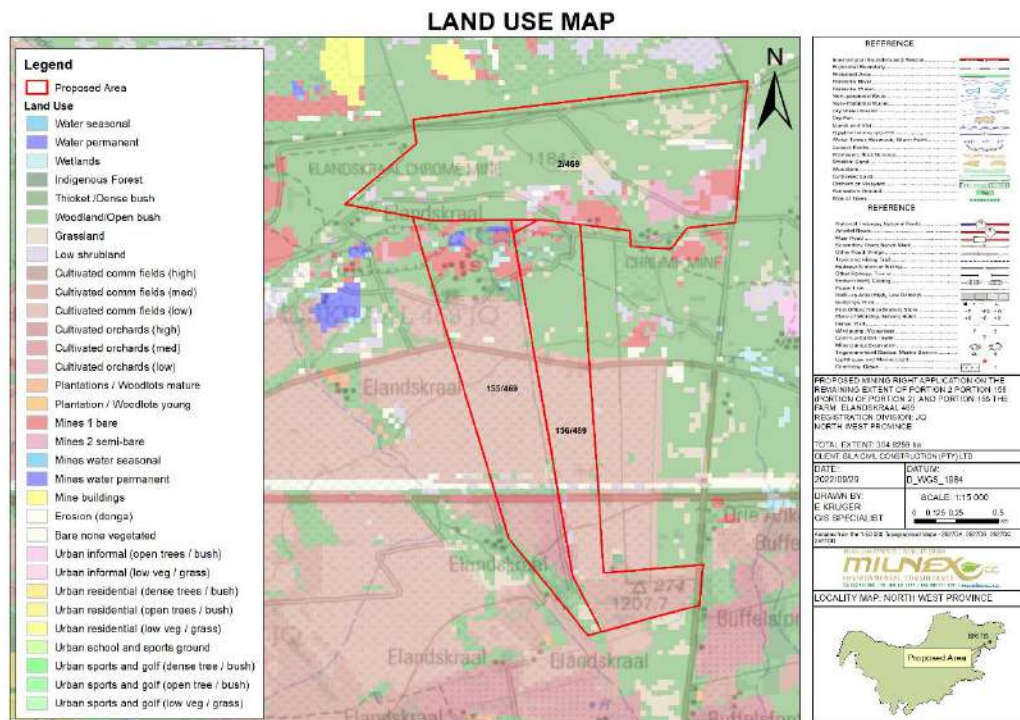


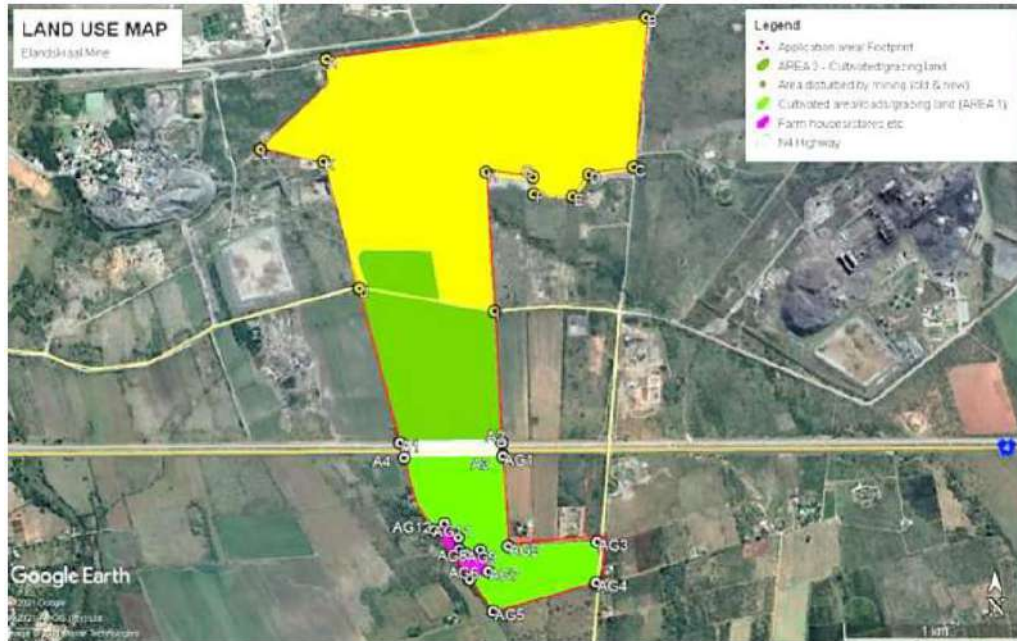
Figure 28: Land use map associated with study site and surrounding areas.

An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under Appendix 11. Please see the findings below:

- the majority of the current land use of the land should be adjusted to reflect MINING ACTIVITIES (old and new) on a major disturbed area of 188 ha;
- the rest of the application area covers an surface area (area 1 &2) that is used for AGRICULTURAL ACTIVITIES. The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural).



- Most of the original vegetation cover was replaced by cultivated fields (planted pastures) and fruit trees.
- The environmental sensitivity as identified by the screening tool should not be VERY HIGH, but LOW sensitivity for the MINING AREA and MEDIUM environmental sensitivity for the Area 1 & 2 Agricultural area.
- Majority of the surface area is (incl. soil cover) disturbed by mining activities such as , opencast voids, waste rock dumps dumped on top of topsoil, gravel access roads, ore stockpiles , topsoil dumps, berms, rehabilitated waste rock dumps, etc. Vegetation cover totally disturbed by mining activities. Shallow soils and rock outcrops found in this area. During 2009 already a portion of the surface area has been regarded “ Degraded land”.



Map from the specialist report

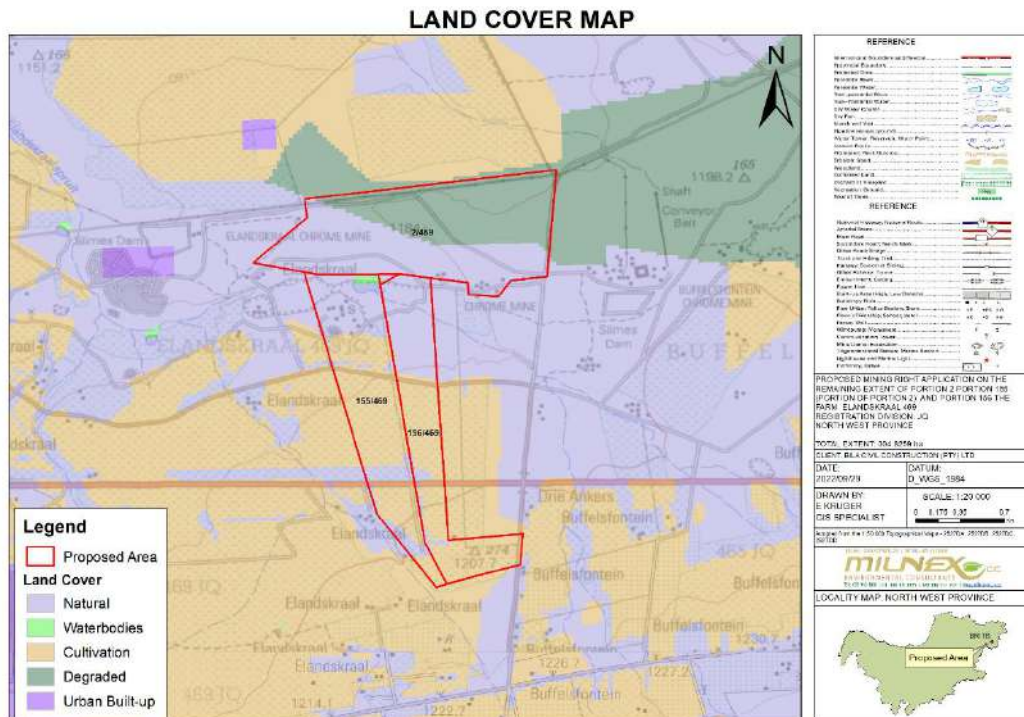


Figure 29: Landcover map associated with study site and surrounding areas.



Figure 30: Google earth map

- v) **The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts—**
- (aa) can be reversed;
  - (bb) may cause irreplaceable loss of resources; and
  - (cc) can be avoided, managed or mitigated;

Please see heading J) *AN ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK*, for the impacts identified and their assessment.

- vi) **THE METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS;**

**Method of environmental assessment**

The environmental assessment aims to identify the various possible environmental impacts that could result from the proposed development. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in the Table below.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

**Impact Rating System**

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

**vii) POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND ON THE COMMUNITY THAT MAY BE AFFECTED FOCUSING ON THE GEOGRAPHICAL, PHYSICAL, BIOLOGICAL, SOCIAL, ECONOMIC, HERITAGE AND CULTURAL ASPECTS;**

*Table 6: Positive and Negative Impacts*

ACTIVITY	PHASE	POTENTIAL NEGATIVE IMPACTS
<b>Site preparation</b> Site Clearance, establishing construction area	Construction Operation Decommissioning	Physical destruction and disturbance of: <ul style="list-style-type: none"> <li>• Biodiversity (thicket is mostly invasive tree species and area is already disturbed by agricultural activities)</li> <li>• Air pollution</li> <li>• Disturbing noise</li> <li>• Visual impacts</li> </ul>
<b>Earthworks</b>	Construction Operation Decommissioning	Excavations: <ul style="list-style-type: none"> <li>• Loss of soil resources and land capability</li> <li>• Physical destruction and disturbance of biodiversity (thicket is mostly invasive tree species and area is already disturbed by agricultural activities)</li> <li>• Possible pollution of surface water resources</li> <li>• Possible alteration of natural drainage patterns</li> <li>• Possible contamination of groundwater</li> <li>• Air pollution</li> <li>• Disturbing noise</li> <li>• Visual impacts</li> </ul>
<b>Civil works</b> Erection of structures, concrete work, steel work, electrical installation, establishing pipelines (if any)	Construction Operation Decommissioning	<ul style="list-style-type: none"> <li>• Loss of mineral reserves</li> <li>• Hazardous structures/excavations/surface subsidence</li> <li>• Loss of soil resources and land capability</li> <li>• Possible pollution of surface water resources</li> <li>• Possible contamination of groundwater</li> <li>• Air pollution</li> <li>• Disturbing noise</li> <li>• Visual impacts</li> </ul>
Open-pit mining, blasting, mining, load, and hauling	Construction Operation	<ul style="list-style-type: none"> <li>• Loss of mineral resources</li> <li>• Loss of soil resources and land capability</li> </ul> Physical destruction and disturbance of: <ul style="list-style-type: none"> <li>• Biodiversity (thicket is mostly invasive tree species and area is already disturbed by agricultural activities)</li> <li>• Air pollution</li> <li>• Disturbing noise</li> <li>• Visual impacts</li> <li>• Possible pollution of surface water resources</li> <li>• Possible contamination of groundwater</li> <li>• Dewatering impacts</li> </ul>
<b>Waste rock management</b> Storage, stockpile or final disposal	Operation Decommissioning Closure (final land form)	<ul style="list-style-type: none"> <li>• Loss of soil resources and land capability</li> <li>• Disturbance of biodiversity (thicket is mostly invasive tree species and area is already disturbed by agricultural activities)</li> </ul>

		<ul style="list-style-type: none"> <li>• Possible pollution of surface water resources</li> <li>• Possible contamination of groundwater</li> <li>• Air pollution</li> <li>• Disturbing noise</li> <li>• Negative landscape and visual impact</li> </ul>
<b>Dirty water management</b> Collection, storage of dirty water for re-use, recycling	Construction Operation Decommissioning	<ul style="list-style-type: none"> <li>• Possible pollution of surface water resources</li> <li>• Possible contamination of groundwater</li> <li>• Disturbing noise</li> </ul>
<b>Stormwater management</b> Stormwater channels and berms, collection of dirty water, storage for re-use	Construction Operation Decommissioning	<ul style="list-style-type: none"> <li>• Possible alteration of drainage patterns</li> <li>• Possible pollution of surface water resources</li> <li>• Possible contamination of groundwater</li> </ul>
<b>Transport systems</b> Use of access points, road transport to and from site for employees and supplies, movement within site boundary (haul roads, conveyors, pipelines), taxi areas	Construction Operation Decommissioning	<ul style="list-style-type: none"> <li>• Disturbance of biodiversity</li> <li>• Noise</li> <li>• Traffic impacts</li> <li>• Visual impacts</li> </ul>
<b>Storage and maintenance services/ facilities</b> Washing vehicles and machinery, storage and handling non-process materials	Construction Operation Decommissioning	<ul style="list-style-type: none"> <li>• Possible pollution of surface water resources</li> <li>• Possible contamination of groundwater resulting from hydrocarbon spills and soil erosion</li> <li>• Disturbing noise</li> </ul>
<b>Demolition</b> Dismantling, demolition, removal of equipment	Operation (as part of maintenance) Decommissioning	<ul style="list-style-type: none"> <li>• Hazardous structures (e.g., fuel tanks)</li> <li>• Loss of soil resources and land capability</li> <li>• Disturbance of biodiversity</li> <li>• Air pollution</li> <li>• Disturbing noise</li> <li>• Visual impacts</li> </ul>
<b>Non-mineralized waste management</b> Transportation of waste materials to waste facility	Construction Operation Decommissioning Closure (limited)	<ul style="list-style-type: none"> <li>• Pollution if not managed and stored properly</li> </ul>
<b>Rehabilitation</b> Replacing soil, slope stabilization, landscaping, re-vegetation, restoration	Construction Operation Decommissioning Closure	<ul style="list-style-type: none"> <li>• Disturbance of biodiversity</li> <li>• Alteration of natural drainage patterns</li> <li>• Contamination of groundwater</li> <li>• Air pollution</li> <li>• Visual impacts</li> </ul>

ACTIVITY	PHASE	POTENTIAL POSITIVE IMPACTS
<b>Job creation</b>	Construction Operation	<ul style="list-style-type: none"> <li>• Temporary employment and other economic benefits</li> </ul>
<b>Maintenance and aftercare</b> Inspection and maintenance of remaining facilities and rehabilitated areas	Closure	<ul style="list-style-type: none"> <li>• Re-establishment of biodiversity</li> </ul>

**viii) THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND LEVEL OF RESIDUAL RISK;**

*(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).*

**Impact of Blasting and Vibration on surrounding area**

**Specialist findings and mitigation (Appendix 11)**

**17.11 Samancor Western Chrome Mines Underground Workings**

Underground workings for the Samancor Western Chrome Mines group are present on the northern side of the planned opencast areas. The following Figure 18 shows location of the underground workings. Blasting on surface will require consideration of the underground operations. The exact depth below surface nor if this active mining area is not known at this stage. Air blast and fly rock is not considered for impact on underground workings.



Figure 18: Location of Samancor underground workings

On discussion with Elandskraal Chrome Mine management it was indicated that mining on surface will be restricted to areas 50 m horizontally from the underground workings. Figure 19 shows simplified layout of restricted area and underground workings.

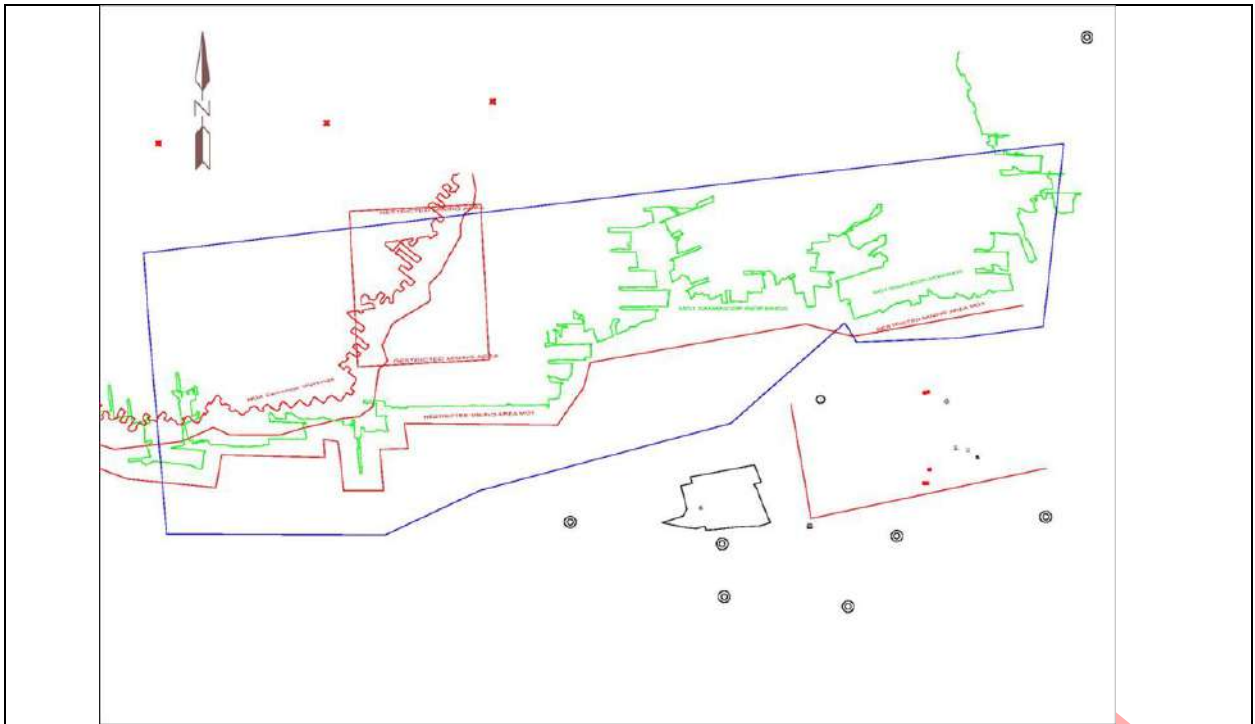


Figure 19: Simplified plan of underground workings

Considering that mainly MG4 will be mined in close proximity of the underground workings the depths below the MG4 needs to be established. There is unfortunately now specific depths of the underground workings available. The Mine Works Plan (MWP) indicated that the MG4 bottom of reef to the top of the MG2 is 26.06 m. The following Figure 20 from the MWP substantiates the depth levels. Based on the 50 m horizontal and Bottom of MG4 a shortest direct distance between possible blasting and the underground workings is 56.35 m.

Similar conditions of surface mining in close proximity to underground workings are found almost everywhere when outcrop layers are being mined for the chromite environment and Platinum Group Metals environment. On a another site with similar situation a limit for ground vibration was established at 150 mm/s. During the excavation of the opencast the limits was adhered too and the crown pillar respected. In this case the crown pillar will be 50 m.

Prediction of expected levels of ground vibration for effect underground is similar to that of surface blasting except that the surface waves – which is one component of the wave type generated from blasting – does not manifest in this situation. Ground vibration consists of surface waves and body waves. Body waves consist of compressional and shear waves. The amplitude of body waves is relatively halve that of surface waves. Thus, scaled distance prediction of ground vibration for the effect of surface blasting on underground is done but the result halved.

Using the scaled distance prediction the expected levels at the underground operations can then be predicted and the following Table 16 shows expected ground vibration levels for specific distances.

Table 16: Ground Vibration Levels Underground

Distance (m)	Min. Charge per Delay (268 kg) PPV (mm/s)	Max. Charge per Delay (810 kg) PPV (mm/s)
56.0	75.1	187.1
60.0	67.0	166.9
80.0	41.7	103.9
100.0	28.9	71.9
120.0	21.4	53.2
140.0	16.6	41.2
160.0	13.3	33.1

180.0	10.9	27.2
200.0	9.2	22.9
220.0	7.9	19.6
240.0	6.8	16.9
260.0	6.0	14.9
280.0	5.3	13.1
300.0	4.7	11.7

Review of the predictions made it is clear that 50 m (horizontal) from the underground workings the maximum charge will exceed allowed limits closer than 80 m. The minimum charge – single hole firing can be allowed up to the 50 m boundary.

It is clear that a minimum of 50 m boundary must be maintained between the surface blasting and the underground blasting operations and a maximum of 620 kg can be allowed safely. At 56 m 620 kg is expected to yield 150 mm/s. However it is recommended that single hole firing is maintained when blasting next to the underground workings.

Blasting next to the underground workings will be restricted and requires careful planning with execution.

### 18.3 Mitigations

In review of the evaluations made in this report it is certain that specific mitigation will be required with regards to ground vibration, air blast and fly rock. Ground vibration is the primary possible cause of structural damage and requires more detailed planning in preventing damage and maintaining levels within accepted norms. Air blast and fly rock can be controlled using proper charging methodology irrespective of the blast hole diameter and patterns used. Ground vibration requires more detailed planning and forms the focus for mitigation measures.

Specific impacts are expected at the following POI's identified. Table 19 shows list of POI's that will need to be considered. Figure 18 shows the location of these POI's in relation to the pit area.

Table 20: Structures identified as problematic in and around the project area

Tag	Description	Classification	Y	X
2	Mine Buildings/Structures	3	-59898.08	2846071.39
3	Mine Buildings/Structures	3	-59925.71	2846232.88
5	Dam	11	-58463.23	2846219.33
9	Road	14	-60159.72	2845922.17
16	Tailings Dam	6	-57685.37	2846107.53
17	Samancor Tailings Dam	6	-58116.19	2846617.58
190	Power Lines/Pylons	13	-60036.04	2845546.75

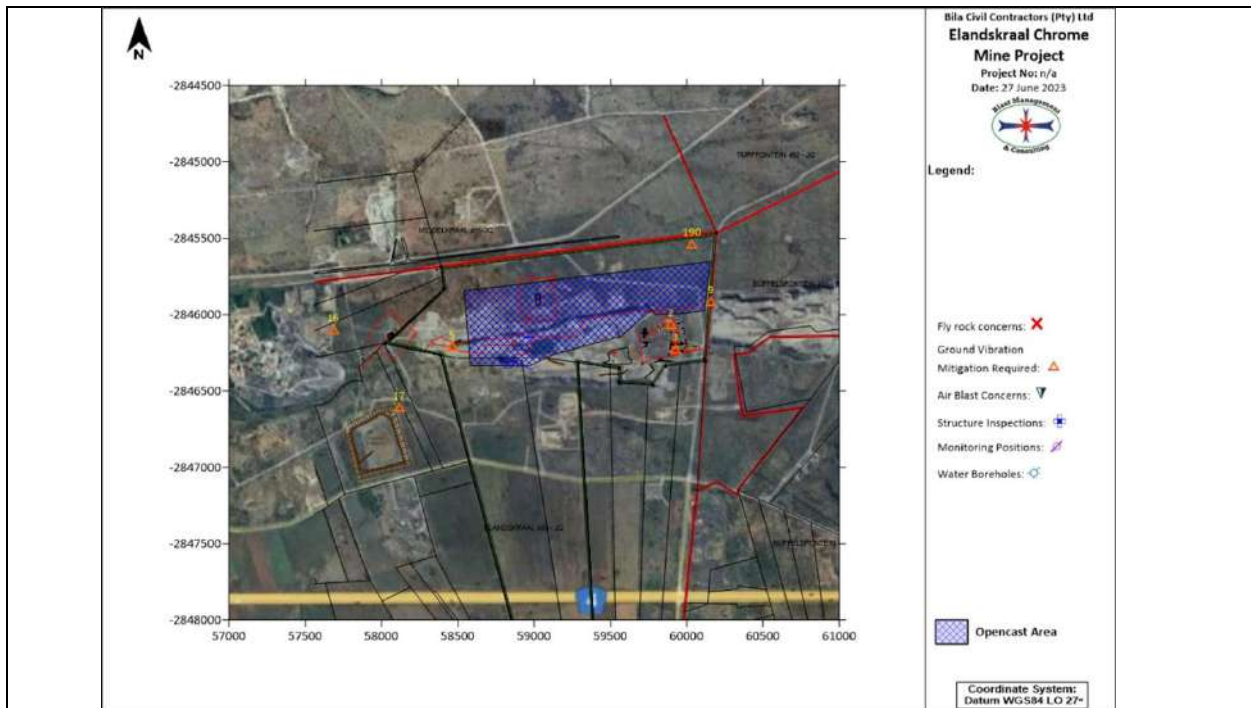


Figure 21: Mitigation POI's

Based on the modelling done, levels exceeding limits based on the maximum charge for specific infrastructure identified are specifically observed up to 874 m from the pit boundary. There are no houses or settlements that are of concern. The following specific mitigations may be considered.:

- 1) Changes to drill and blast design to mitigate ground vibration.
- 2) Changes to charging designs to mitigate air blast and fly rock.

**Air blast and Fly rock:**

Air blast and fly rock is mitigated by the following means:

- 1) Increasing the stemming length ratio to blasthole diameter – either changing to a smaller diameter blasthole or increasing the actual stemming length.
- 2) The use of aggregate stemming material of correct size ratio – 10 % of the blasthole diameter.

**Ground Vibration:**

Mitigation of ground vibration for this can be done applying the following methods:

- Do blast design that considers the actual blasting, and the ground vibration levels to be adhered to.
- Change to bench heights with smaller diameter blastholes can be considered.
- Multiple charge decks in a blastholes initiated separately to reduce the charge mass per delay can be considered.
- Only apply electronic initiation systems to facilitate single hole firing.
- Do design for smaller diameter blast holes that will use fewer explosives per blast hole.

The identified POI's of concern is found in close proximity of the actual operations. In order to give indication of the possibilities of mitigation to consider two basic indicators are presented. Firstly, the maximum charge per delay that can be allowed for the shortest distance between blast and POI. Secondly the minimum distance between blast and POI to maintain ground vibration limits for minimum and maximum charge per delay. These table gives indication for planning of blasts when blasts at shortest distance to the POI's.

All POI's within 100 m from the pit boundary must be reviewed and action plan structure for management of impacts regarding these POI's. Calculating permissible charge mass per delay for these POI's creates charges too small for a viable mining option. Table 21 do show mitigation in the form of maximum charge mass that will be allowed to maintain safe levels of ground vibration. Table 22 shows minimum distance between blast and POI to maintain ground vibration limits for minimum and maximum charge per delay.



Table 21: Mitigation measures: Maximum charge per delay for distance to POI

Tag	Description	Y	X	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)	Predicted PPV (mm/s)	Structure Response @ 10Hz
2	Mine Buildings/Structures	-59898.08	2846071.39	25	76	56	25	Acceptable
3	Mine Buildings/Structures	-59925.71	2846232.88	25	239	554	25	Acceptable
5	Dam	-58463.23	2846219.33	50	109	268	50	Acceptable
9	Road	-60159.72	2845922.17	150	36	108	150	Acceptable
16	Tailings Dam	-57685.37	2846107.53	4	874	806	4	Acceptable
17	Samancor Tailings Dam	-58116.19	2846617.58	4	547	316	4	Acceptable
190	Power Lines/Pylons	-60036.04	2845546.75	75	118	513	75	Acceptable

These POI's vary in distance and it will be required that each be evaluated in relation to a blast to be done. The distance should be checked, the charge mass allowed be calculated and then a design of charging or timing applied to ensure that the limits are not exceeded. In most cases basic planned design does not need to change but timing can be adjusted using electronic initiation systems to ensure reduced the charge mass per delay. This must be confirmed with monitoring of ground vibration at the POI.

The following Table 22 shows the minimum distance required between blast and POI for the minimum and maximum charge per delay to maintain the ground vibration limits applied.

Table 7: Mitigation measures: Minimum distances required

Tag	Example POI	Specific Limit (mm/s)	Distance (m) Required	Total Mass/Delay (kg)
<b>Minimum charge per delay</b>				
	Samancor Tailings Dam	4	504	268
	Mine Buildings/Structures	25	166	268
	Dam	50	109	268
	Power Lines/Pylons	75	85	268
	Road	150	56	268
<b>Maximum charge per delay</b>				
	Samancor Tailings Dam	4	876	810
	Mine Buildings/Structures	25	289	810
	Dam	50	190	810
	Power Lines/Pylons	75	148	810
	Road	150	97	810

Data provided in tables above clearly indicate that distance between blast and POI will have influence on the allowed charge mass per delay with regards to the different ground vibration limits.

### **21. Monitoring**

A monitoring programme for recording blasting operations is recommended. The following elements should be part of such a monitoring program:

- Ground vibration and air blast results;
- Blast Information summary;
- Meteorological information at time of the blast;
- Video Recording of the blast;
- Fly rock observations.

Four monitoring points were identified as possible locations that will need to be considered. Monitoring positions are indicated in Figure 22 and Table 23 lists the positions with coordinates. These points will need to be re-defined after the first blasts done and the monitoring programme defined.

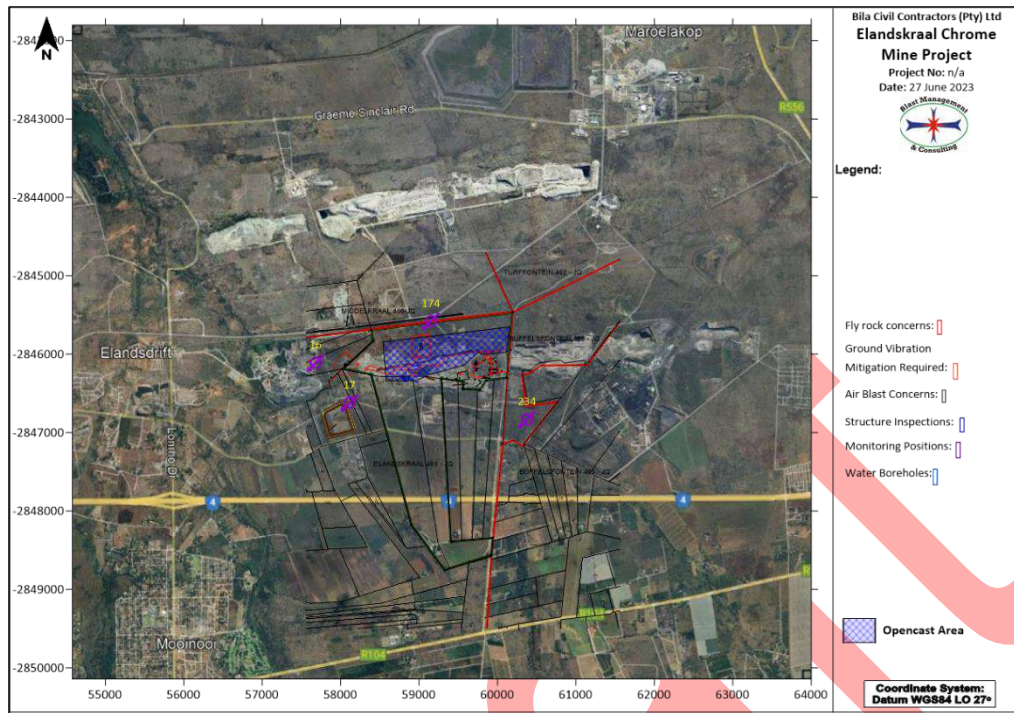


Figure 22: Suggested monitoring positions

Table 23: List of possible monitoring positions

Tag	Description	Y	X
16	Tailings Dam	-57685.37	2846107.53
17	Samancor Tailings Dam	-58116.19	2846617.58
174	Power Lines/Pylons	-59153.66	2845578.27
234	Informal Settlement	-60378.99	2846828.39

Mitigation measure included in the Environmental Management Programme (EMPr) for the above concerns.

1. Comply with the Mine Health and Safety Act, 29 of 1996 Regulations. The duties/functions are imposed on/assigned to Bila Civil Contractors (Pty) Ltd.
2. Changes to drill and blast design to mitigate ground vibration.
3. Changes to charging designs to mitigate air blast and fly rock.
4. Proper and appropriate communication with neighbours about blasting, monitoring and actions done for proper control will be required.
5. Blast designs should be reviewed on a regular basis to ensure all blasting activities are within the legal and accepted standards.
6. Safe blasting distance and evacuation is calculated at a minimum distance of 493 m.
7. Stop and Go procedures during blasting will be required.
8. Implement monitoring programme for recording blasting operations.
9. Attempts should be made to keep to the recommended ground vibration air blast limits (Table 26 within the Blast Impact Assessment Report).
10. Blasting should occur in favourable weather conditions as far as possible.
  - o Do not blast too early in the morning when it is still cool or when there is a possibility of atmospheric inversion or too late in the afternoon in winter.
  - o Do not blast in fog.
  - o Do not blast in the dark
  - o Refrain from blasting when wind is blowing strongly in the direction of an outside receptor.
  - o Do not blast with low overcast clouds.

11. Blasting notice boards must be sent up at various routes around the mining right area to inform the community of blasting dates and times.
12. Monitoring could be done using permanent installed stations (consult Section 21, Figure 22 and Table 23 of the Blasting Impact Assessment report for suggested monitoring positions).

**Air blast and Fly rock:**

1. Increasing the stemming length ratio to blasthole diameter – either changing to a smaller diameter blasthole or increasing the actual stemming length.
2. The use of aggregate stemming material of correct size ratio – 10 % of the blasthole diameter.

**Ground Vibration:**

3. Do blast design that considers the actual blasting, and the ground vibration levels to be adhered to.
4. Change to bench heights with smaller diameter blastholes can be considered.
5. Multiple charge decks in a blastholes initiated separately to reduce the charge mass per delay can be considered.
6. Only apply electronic initiation systems to facilitate single hole firing.
7. Do design for smaller diameter blast holes that will use fewer explosives per blast hole.
8. Distance between blast and POI will have influence on the allowed charge mass per delay with regards to the different ground vibration limits, consult table 20 and table 21 in the Blast Impact Assessment specialist report.

**Underground workings:**

- 1) The charging and timing of blastholes should be recalculated not to exceed charge masses that will yield expected levels greater than 150 mm/s at the underground workings.
- 2) A proper crown pillar distance between the underground workings and surface blasting must be confirmed – a rock engineer needs to make proper recommendation which must be implemented.

**Note:**

Adverse environmental associated with the mining activity have been identified through the Scoping & EIR process. Mitigation measures as set out in the Environmental Management Programme (EMPr) attached in Part B must be implemented in order to minimise any potential impacts.

All comments received during the review period of the Scoping and EIR report, as well as response provided is captured and recorded within the Comments and Response Report and will be attached in the final EIR.

**ix) IF NO ALTERNATIVE DEVELOPMENT [LOCATION] FOOTPRINTS FOR THE ACTIVITY WERE INVESTIGATED, THE MOTIVATION FOR NOT CONSIDERING SUCH; AND**

As discussed in the previous section, based on outcomes of previous studies in the vicinity of the proposed site, it is expected that high volumes of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody near Mooinooi on Portion 2, Portion 155 & Portion 156 of the farm Elandsdraal 469, Registration Division: JQ, North West province.

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102). Therefore, the applicant does not have an alternative location

**x) A CONCLUDING STATEMENT INDICATING THE LOCATION OF THE PREFERRED ALTERNATIVE DEVELOPMENT [LOCATION] FOOTPRINT WITHIN THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT;**

(Provide a statement motivating the final site layout that is proposed)

Design alternatives were considered throughout the planning and design phase (i.e. where is the Minerals are located?). The layout follows the limitations of the site and aspects such as, roads, site offices, workshop area and exiting infrastructure constructed under the existing prospecting right.

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102).

The location of the activities will be determined based on the location of the proposed opencast area as outlined in Figure 4.

**I. A FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS THE ACTIVITY AND ASSOCIATED STRUCTURES AND INFRASTRUCTURE WILL IMPOSE ON THE PREFERRED [LOCATION] DEVELOPMENT FOOTPRINT ON THE APPROVED SITE**

(AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT THROUGH THE LIFE OF THE ACTIVITY, INCLUDING—.)

**i. A description of all environmental issues and risks that are identified during the environmental impact assessment process**

**Process for the identification of key issues**

The methodology for the identification of key issues aims, as far as possible, to provide a user-friendly analysis of information to allow for easy interpretation.

- **Checklist:** The checklist consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts.
- **Matrix:** The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity. The matrix is designed to indicate the relationship between the different stressors and receptors which leads to specific impacts. The matrix also indicates the specialist studies, which will be submitted as part of the Environmental Impact Report in order to address the potentially most significant impacts.

**Checklist analysis**

The site visit was conducted to ensure a proper analysis of the site specific characteristics of the study area. The table below provides a checklist, which is designed to stimulate thought regarding possible consequences of specific actions and so assist scoping of key issues. It consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts. The table highlights certain issues, which are further analysed in matrix format.

**Table 8: Environmental Checklist**

QUESTION	YES	NO	Un-sure	Description
<b>1. Are any of the following located on the site earmarked for the development?</b>				
I. A river, stream, dam or wetland	X			According to the Wetland areas map there are a Channelled valley-bottom wetland on the proposed area.  A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under <b>Appendix 11</b> . According to the report there is one National Freshwater Ecosystem Protected Areas (NFEPAs) in the project area, but this is an artificial wetland created by previous mining activities. The state of the wetland to the south of the prospecting activities is considered very disturbed due to the prospecting activities that occurs to the west and north of the wetland.
II. A conservation or open space area		X		None
III. An area that is of cultural importance	X			According to the Phase 1 Heritage Impact Assessment ( <b>Appendix 11</b> ) a cemetery was identified on the proposed area and a 20m buffer zone must be placed around the graveyard. The cemetery is rated Local Significance (Grade 3A).
IV. Site of geological significance		X		According to the Phase 1 Heritage Impact Assessment ( <b>Appendix 11</b> ) the Palaeontologically insignificant Bushveld Complex granites that are capped by superficial (Quaternary) deposits considered to be of low palaeontological sensitivity underlie the study area.
V. Areas of outstanding natural beauty		X		

VI. Highly productive agricultural land			×	A certain area of the proposed area is covered by cultivation. According to the land capability map the proposed area falls within land capability Class 3.  According to the Agricultural Agro-Ecosystem Specialist Assessment Report, the environmental sensitivity as identified by the screening tool should not be VERY HIGH, but LOW sensitivity for the MINING AREA and MEDIUM environmental sensitivity for the Area 1 & 2 Agricultural area.
VII. Floodplain			×	None.
VIII. Indigenous forest			×	According to the Land Use map the area is mostly covered by Woodland / Open Bush and Grasslands
IX. Grass land			×	A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under <b>Appendix 11</b> . According to the report there are open grassland patches. The mining and the cultivated crops areas are disturbed to the extent that there is almost no natural vegetation remaining
X. Bird nesting sites			×	A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under <b>Appendix 11</b> . According to the report:  <i>The screening tool listed one vulnerable plant species and one vulnerable animal species. Non of these were recorded and it is unlikely that they will be present in the project area, as they are sensitive to disturbance and the area is disturbed. The screening tool also lists one bird species namely Sagittarius serpentarius (secretary bird). The habitat is not ideal for Secretary birds, as they prefer open grassland or savanna. The vegetation in the project area is too dense. They usually roost in trees of the genus Vachelia or Balanites and although there are Vachelia trees, they are not very big.</i>
XI. Red data species			×	A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under <b>Appendix 11</b> . According to the report:  <i>The screening tool listed one vulnerable plant species and one vulnerable animal species. Non of these were recorded and it is unlikely that they will be present in the project area, as they are sensitive to disturbance and the area is disturbed. The screening tool also lists one bird species namely Sagittarius serpentarius (secretary bird). The habitat is not ideal for Secretary birds, as they prefer open grassland or savanna. The vegetation in the project area is too dense. They usually roost in trees of the genus Vachelia or Balanites and although there are Vachelia trees, they are not very big.</i>
XII. Tourist resort			×	None.
<b>2. Will the project potentially result in potential?</b>				
I. Removal of people			×	
II. Visual Impacts			×	The visual impact will be managed.
III. Noise pollution			×	The noise impact will be managed.  The possible noise and increased ground vibration during blasting and mine activities
IV. Construction of an access road			×	Existing access roads will be used which will be upgraded.  Roads to be constructed will be within the Mining area with speed limit signs. This will be gravel roads.

V. Risk to human or valuable ecosystems due to explosion/fire/ discharge of waste into water or air.	×			Explosives will be used to blast the solid overburden and ore
VI. Accumulation of large workforce (>50 manual workers) into the site.	×			Approximately 56 employment opportunities will be created during the construction and operational phase of the project.
VII. Utilisation of significant volumes of local raw materials such as water, wood etc.	×			A Water Use License Application (WULA) was submitted to DWS for the mining activities.
VIII. Job creation	×			Approximately 56 employment opportunities will be created during the construction and operational phase of the project.
IX. Traffic generation	×			Moderate Increased traffic movement of trucks
X. Soil erosion	×			Only areas earmarked for mining will be cleared. The mining will be phased and the topsoil stockpiled separately.
XI. Installation of additional bulk telecommunication transmission lines or facilities		×		None.
<b>3. Is the proposed project located near the following?</b>				
I. A river, stream, dam or wetland	×			According to the Terrestrial Biodiversity Impact Assessment there is a NFEPA wetland approximately 500m Northwest from the proposed area,
II. A conservation or open space area	×			According to the protected areas map the Magaliesberg Nature Area, which is a Formally protected area, is approximate 1km from the proposed portions.
III. An area that is of cultural importance			×	
IV. A site of geological significance			×	
V. An area of outstanding natural beauty		×		None
VI. Highly productive agricultural land			×	According to the land capability map the surrounding area falls within land capability Class 3.
VII. A tourist resort		×		
VIII. A formal or informal settlement	×			The application area is not far from homesteads

### Matrix analysis

The matrix describes the relevant listed activities, the aspects of the development that will apply to the specific listed activity, a description of the environmental issues and potential impacts, the significance and magnitude of the potential impacts, and the mitigation of the potential impacts. The matrix also highlights areas of particular concern, which requires more in depth assessment. Each cell is evaluated individually in terms of the nature of the impact, duration and its significance – should no mitigation measures be applied. This is important since many impacts would not be considered insignificant if proper mitigation measures were implemented. The matrix also provides an indication if mitigation measures are available.

In order to conceptualise the different impacts the matrix specify the following:

- **Stressor:** Indicates the aspect of the proposed activity, which initiates and cause impacts on elements of the environment.
- **Receptor:** Highlights the recipient and most important components of the environment affected by the stressor.
- **Impacts:** Indicates the net result of the cause-effect between the stressor and receptor.
- **Mitigation:** Impacts need to be mitigated to minimise the effect on the environment.

ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;

LISTED ACTIVITY (The Stressor)	ASPECTS OF THE DEVELOPMENT /ACTIVITY	POTENTIAL IMPACTS		SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS			MITIGATION OF POTENTIAL IMPACTS	SPECIALIST STUDIES / INFORMATION	
		Receptors	Impact description	Minor	Major	Duration	Possible Mitigation		
<b>CONSTRUCTION PHASE</b>									
<p><b>Listing Notice 1 (GNR 327), Activity 19:</b> The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</p> <p><b>Listing Notice 1 (GNR 327), Activity 14:</b> The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.</p> <p><b>Listing Notice 1 (GNR 327), Activity 24:</b> The development of a road— (ii) with a reserve wider than 13,5 metres, or where no reserve exists where the road is wider than 8 metres;</p> <p><b>Listing Notice 2 (GNR 325), Activity 15:</b> "The clearance of an area of 20 hectares or more, of indigenous vegetation."</p> <p><b>Listing Notice 2 (GNR 325), Activity 17 (Amended GNR 517: 2021):</b> "Any activity including the operation of that activity which requires a mining right in terms of section 22 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice, in Listing Notice 1 of 2014 or Listing Notice 3 of 2014, required to exercise the mining right."</p> <p><b>Listing Notice 2 (GNR 325), Activity 19 (Amended GNR 517: 2021):</b> "The removal and disposal of minerals which requires permission contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002, as well as any other applicable activity as contained in this Listing Notice, Listing Notice 1 of 2014 or in Listing Notice 3 of 2014, required to exercise the permission"</p> <p><b>Listing Notice 3 GNR 324, Activity 4:</b> The development of a road wider than 4 metres with a reserve less than 13,5 metres, (h) North West (ii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (iv) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority;</p> <p><b>Listing Notice 3 (GNR 324), Activity 10:</b> The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where</p>	<p>Site clearing and preparation Areas earmarked for mining will need to be cleared, topsoil will be stockpiled separately. This will inevitably result in the removal of indigenous vegetation located on the site.</p>	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	<ul style="list-style-type: none"> <li>Loss or fragmentation of indigenous natural vegetation.</li> <li>Loss of sensitive species.</li> <li>Loss or fragmentation of habitats.</li> </ul>		-	M	Yes	-
			Air	<ul style="list-style-type: none"> <li>Air pollution due to the increase of traffic of construction vehicles.</li> </ul>	-		M	Yes	-
			Soil	<ul style="list-style-type: none"> <li>Soil degradation, including erosion.</li> <li>Loss of topsoil.</li> <li>Disturbance of soils and existing land use (soil compaction).</li> </ul>		-	S	Yes	-
			Geology	<ul style="list-style-type: none"> <li>It is not foreseen that the removal of indigenous vegetation will impact on the geology or vice versa.</li> </ul>	N/A	N/A	N/A	N/A	-
			Existing services infrastructure	<ul style="list-style-type: none"> <li>Generation of waste that need to be accommodated at a licensed landfill site.</li> <li>Generation of sewage that need to be accommodated by the local sewage plant.</li> </ul>		-	S	Yes	-
			Ground water	<ul style="list-style-type: none"> <li>Pollution due to construction vehicles.</li> </ul>	-		S	Yes	-
			Surface water	<ul style="list-style-type: none"> <li>Increase in storm water run-off.</li> <li>Pollution of water sources due to soil erosion.</li> <li>Destruction of watercourses (pans/dams/streams/wetlands).</li> </ul>		-	S	Yes	-
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	<ul style="list-style-type: none"> <li>Job creation.</li> <li>Business opportunities.</li> <li>Skills development.</li> </ul>		+	S	Yes	-
			Visual landscape	<ul style="list-style-type: none"> <li>Potential visual impact on residents of farmsteads, settlements and motorists in close proximity to proposed facility.</li> </ul>	-		L	Yes	-
			Traffic volumes	<ul style="list-style-type: none"> <li>Increase in construction vehicles.</li> </ul>	-		S	Yes	-
			Health & Safety	<ul style="list-style-type: none"> <li>Air/dust pollution.</li> <li>Road safety.</li> <li>Increased risk of veld fires.</li> </ul>		-	S	Yes	-
			Noise levels	<ul style="list-style-type: none"> <li>The generation of noise as a result of construction vehicles, the use of machinery such as drills, excavators, rotary pans, dumper trucks and people working on the site.</li> </ul>		-	L	Yes	-
		Tourism industry	<ul style="list-style-type: none"> <li>Since there is no tourism facility in close proximity to the site, the construction activity will have no impact on tourism in the area.</li> </ul>	N/A	N/A	N/A	N/A	-	



<p>such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. <b>(h) North West, (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; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.</b></p> <p><b>Listing Notice 3 (GNR 324), Activity 12:</b> The clearance of an area of 300 square metres or more of indigenous vegetation; <b>(h) North West (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; or (vi) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.</b></p> <p><b>NEM:WA 59 of 2008</b>  <u>Storage of hazardous waste</u>                  Category B: (1) The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.</p> <p><u>Treatment of waste</u>                  Category B: (5) The treatment of hazardous waste in lagoons, excluding the treatment of effluent, wastewater or sewage.</p> <p><u>Disposal of waste on land:</u>                  Category B: (7) The disposal of any quantity of hazardous waste to land.</p> <p>Category B: (8) The disposal of general waste to land covering an area in excess of 200m<sup>2</sup> and with a total capacity exceeding 25 000 tons.</p> <p>Category B: (9) The disposal of inert waste to land in excess of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.</p> <p><u>Construction of facilities and associated structures &amp; infrastructure:</u>                  Category B: (10) The construction of a facility for a waste management activity listed in</p> <p>Category B of this Schedule</p>	<p>The key components of the proposed project are described below:</p> <ul style="list-style-type: none"> <li>• <u>Supporting Infrastructure</u> - A control facility with basic services such as water and electricity will be constructed on the site and will have an approximate footprint 50m<sup>2</sup> or less. Other supporting infrastructure includes a site office and workshop area.</li> <li>• <u>Roads</u> – Existing roads are used to access the proposed area. If roads are made it will be within the Mining area which will be unpaved roads.</li> <li>• <u>Fencing</u> - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.</li> </ul>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">BIOPHYSICAL ENVIRONMENT</p>	Heritage resources	<ul style="list-style-type: none"> <li>• Removal or destruction of archaeological and/or paleontological sites.</li> <li>• Removal or destruction of buildings, structures, places and equipment of cultural significance.</li> <li>• Removal or destruction of graves, cemeteries and burial grounds.</li> </ul>	-	S	Yes	-			
			<b>OPERATIONAL PHASE</b>								
			Fauna & Flora	<ul style="list-style-type: none"> <li>• Fragmentation of habitats.</li> <li>• Establishment and spread of declared weeds and alien invader plants (operations).</li> </ul>	-	L	Yes	-			
			Air quality	<ul style="list-style-type: none"> <li>• Air pollution due to the mining activity, crusher plant, transport of the gravel to the designated areas and blasting.</li> </ul>	-	M	Yes	-			
			Soil	<ul style="list-style-type: none"> <li>• Soil degradation, including erosion.</li> <li>• Disturbance of soils and existing land use (soil compaction).</li> <li>• Loss of agricultural potential (medium significance relative to agricultural potential of the site).</li> </ul>	-	L	Yes	-			
			Geology	<ul style="list-style-type: none"> <li>• Collapsible soil.</li> <li>• Seepage (shallow water table).</li> <li>• Active soil (high soil heave).</li> <li>• Erodible soil.</li> <li>• The presence of undermined ground.</li> <li>• Instability due to soluble rock.</li> <li>• Steep slopes or areas of unstable natural slopes.</li> <li>• Areas subject to seismic activity.</li> <li>• Areas subject to flooding.</li> <li>• Blasting</li> </ul>	-	L	Yes	-			
			Existing services infrastructure	<ul style="list-style-type: none"> <li>• Generation of waste that need to be accommodated at a licensed landfill site.</li> <li>• Generation of sewage that need to be accommodated by the municipal sewerage system and the local sewage plant.</li> <li>• Increased consumption of water.</li> </ul>	-	L	Yes	-			
			Ground water	<ul style="list-style-type: none"> <li>• Leakage of hazardous materials. The machinery on site requires oils and fuel to function. Leakage of these oils and fuels can contaminate water supplies.</li> <li>• Pollution due to blasting</li> </ul>	-	L	Yes	-			
			Surface water	<ul style="list-style-type: none"> <li>• Increase in storm water runoff. The development will potentially result in an increase in storm water run-off that needs to be managed to prevent soil erosion.</li> <li>• Destruction of watercourses (pans / dams / streams / wetlands).</li> <li>• Leakage of hazardous materials. The machinery on site require oils and fuel to function. Leakage of these oils and fuels can contaminate water supplies.</li> </ul>	-	L	Yes	-			
			SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	<ul style="list-style-type: none"> <li>• Job creation. Security guards will be required for 24 hours every day of the week and general laborers will also be required for the cleaning of the panels.</li> <li>• Skills development.</li> </ul>	+	L	Yes	-		
Visual landscape	<ul style="list-style-type: none"> <li>• The certain areas are used for cultivation which will still take place simultaneously with the mining activity, however this depends on the location of the activity.</li> </ul>	-	L	Yes	-						
Traffic volumes	<ul style="list-style-type: none"> <li>• Increase in vehicles collecting material for distribution.</li> </ul>	-	S	Yes	-						
Health & Safety	<ul style="list-style-type: none"> <li>• Air/dust pollution.</li> <li>• Road safety.</li> </ul>	-	S	Yes	-						

			Noise levels	<ul style="list-style-type: none"> <li>The proposed development will result in noise pollution during the operational phase.</li> </ul>	-	-	L	Yes	-
			Tourism industry	<ul style="list-style-type: none"> <li>Since there is no tourism facility in close proximity to the site, the operational activities will have no impact on tourism in the area.</li> </ul>	N/A	N/A	N/A	N/A	-
			Heritage resources	<ul style="list-style-type: none"> <li>It is not foreseen that the proposed activity will impact on heritage resources or vice versa.</li> </ul>	N/A	N/A	N/A	N/A	-
<b>DECOMMISSIONING PHASE</b>									
	<p>Mine closure During the mine closure the Mine and its associated infrastructure will be dismantled.</p> <p>Rehabilitation of biophysical environment The biophysical environment will be rehabilitated.</p>		Fauna & Flora	<ul style="list-style-type: none"> <li>Re-vegetation of exposed soil surfaces to ensure no erosion in these areas.</li> </ul>		+	L	Yes	-
			Air quality	<ul style="list-style-type: none"> <li>Air pollution due to the increase of traffic of construction vehicles.</li> </ul>	-		S	Yes	-
			Soil	<ul style="list-style-type: none"> <li>Backfilling of all voids</li> <li>Placing of topsoil on backfill</li> </ul>		+	L	Yes	-
			Geology	<ul style="list-style-type: none"> <li>It is not foreseen that the decommissioning phase will impact on the geology of the site or vice versa.</li> </ul>	N/A	N/A	N/A	N/A	-
			Existing services infrastructure	<ul style="list-style-type: none"> <li>Generation of waste that need to be accommodated at the local landfill site.</li> <li>Generation of sewage that need to be accommodated by the municipal sewerage system and the local sewage plant.</li> <li>Increase in construction vehicles.</li> </ul>	-		S	Yes	-
			Ground water	<ul style="list-style-type: none"> <li>Pollution due to construction vehicles.</li> </ul>	-		S	Yes	-
			Surface water	<ul style="list-style-type: none"> <li>Increase in storm water run-off.</li> <li>Pollution of water sources due to soil erosion.</li> <li>Destruction of watercourses (pans / dams / streams / wetlands).</li> </ul>	-		S	Yes	-
			Local unemployment rate	<ul style="list-style-type: none"> <li>Loss of employment.</li> </ul>		-	L	Yes	-
			Visual landscape	<ul style="list-style-type: none"> <li>Potential visual impact on visual receptors in close proximity to proposed facility.</li> </ul>	-		S	Yes	-
			Traffic volumes	<ul style="list-style-type: none"> <li>Increase in construction vehicles.</li> </ul>	-		S	Yes	-
			Health & Safety	<ul style="list-style-type: none"> <li>Air/dust pollution.</li> <li>Road safety.</li> <li>Increased crime levels. The presence of mine workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people in the rural area.</li> </ul>	-			Yes	-
			Noise levels	<ul style="list-style-type: none"> <li>The generation of noise as a result of construction vehicles, the use of machinery and people working on the site.</li> </ul>	-		S	Yes	-
			Tourism industry	<ul style="list-style-type: none"> <li>Since there is no tourism facility in close proximity to the site, the decommissioning activities not have an impact on tourism in the area.</li> </ul>	N/A	N/A	N/A	N/A	-
			Heritage resources	<ul style="list-style-type: none"> <li>It is not foreseen that the decommissioning phase will impact on any heritage resources.</li> </ul>	N/A	N/A	N/A	N/A	-

(N/A) No impact (+) Positive Impact (-) Negative Impact (S) Short Term (M) Medium Term (L) Long Term

**J. AN ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK, INCLUDING—**

- (i) cumulative impacts;
- (ii) the nature, significance and consequences of the impact and risk;
- (iii) the extent and duration of the impact and risk;
- (iv) the probability of the impact and risk occurring;
- (v) the degree to which the impact and risk can be reversed;
- (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and
- (vii) the degree to which the impact and risk can be mitigated;

**Significance of potential impacts**

The following sections present the outcome of the significance rating exercise. The results suggest that almost none of the key issues identified as part of the EIR process had a negative high environmental significance. Instead the overall score indicate a low environmental significance score.

**Table: The rating system**

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).

4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
<b>INTENSITY/ MAGNITUDE</b>		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
<b>REVERSIBILITY</b>		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
<b>IRREPLACEABLE LOSS OF RESOURCES</b>		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
<b>CUMULATIVE EFFECT</b>		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
<b>SIGNIFICANCE</b>		

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

**INITIAL CLEARANCE AND SITE PREPARATION PHASE**

**Direct impacts:** During this phase minor negative impacts are foreseen over the short term. The latter refers to a period of weeks. The site preparation may result in the loss or fragmentation of indigenous natural fauna and flora, loss or fragmentation of habitats, soil erosion, hydrology, and temporary noise disturbance, generation of waste, visual intrusions, increase in heavy vehicle traffic, and risk to safety, livestock and farm infrastructure, and increased risk of veld fires. The abovementioned impacts are discussed in more detail below:

- Loss, destruction or fragmentation of indigenous natural fauna and flora:

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

<p><b>5. DESCRIPTION AND ASSESSMENT OF ECOLOGICAL IMPACTS</b></p> <p><b>5.1.1 List of impacts</b></p> <ul style="list-style-type: none"> <li>• <b>Removal of indigenous vegetation</b></li> </ul> <p>If mining activities expand into natural vegetation, indigenous vegetation will be removed. Loss of plant communities and flora species of significance may be caused due to the opencast mining activities, increased laydown area of the overburden and topsoil facilities, that used to represent natural vegetation communities. Rehabilitation of some areas would be possible but there is likely to be long-term disturbance in large areas.</p> <ul style="list-style-type: none"> <li>• <b>Habitat destruction</b></li> </ul> <p>The clearance of vegetation will destroy the habitat of some species and may fragment other habitats.</p> <ul style="list-style-type: none"> <li>• <b>Spread of alien and invader species</b></li> </ul>
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Continued movement of personnel and vehicles on and off the site during the mining phase, will result in a risk of importation of alien species. Vehicles often transport many seeds and some may be of invader species, which may become established along the road, especially where the area is disturbed. The high levels of habitat disturbance also provide the greatest opportunities for invader species to establish themselves, since most indigenous species are less tolerant of disturbance. The spread of alien invasive plants on site is more INTENSE during the operational phase of the mine due to the movement of vehicles over an extended area on and from the site, causing a higher risk of potentially spreading the seeds or vegetative material from invasive species. Although construction creates the suitable conditions for establishment of invasive species, the operational phase certainly carries by far the greatest risk of alien invasive species being spread through the area. This risk is further influenced by increased run-off as a result of exposed areas and hardened surfaces created during the construction phase of the mine.

- **Disturbance of fauna and fauna fatalities**

Disturbance of remnant terrestrial wild mammal, avian, amphibian and insect fauna would probably occur through physical habitat destruction, noise, traffic and movement of people. The impact of the mining would be MODERATE to LOW considering that the area in general is already in a degraded state due to the surrounding mining activities and local communities. Therefore, animals would move away from the area, while some ground-burrowing species such as moles and reptiles might be killed in the process. Furthermore, opencast developments can threaten migration routes or flight paths as a result of noise and dust pollution. Cumulative impacts of illegal collecting, road kills or power line related deaths reduce population viability in the long-term. Some mining related habitats also favour species leading to un-natural competition with endemic fauna.

- **Soil erosion and sedimentation**

Vegetation prevents soil erosion. Once it is removed, soil erosion can occur. The increased hardened surfaces around infrastructure and exposed areas created alongside the open pit, as well as the roads and additional surface areas created on the slopes of the stockpiles and overburden facility will have a definite impact on the potential erosion of exposed areas

- **Pollution**

Exposure of rocks, ore and soils to rainfall and wind may lead to atmospheric contamination from dust and increased erosion of the site and sedimentation of local water courses. An increase in the movement of construction vehicles will result in an increase in the dust levels in the area. The environmental impacts of wind-borne dust, gases and particulates from the mining activities will have an impact on the vegetation of the area when dust settles on plant material reducing the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity and growth.

Heavy machinery and vehicles as well as sewage and domestic waste would be the main contributors to potential pollution problems relating to soil and water pollution on the project site.

### 5.1.3 Impact assessment

The impact assessment is given in Table 19 Impacts are assessed with mitigation (WM) and without mitigation (WOM).

Table 19: Impact assessment

Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM
Removal of indigenous vegetation	Negative	Definite (WOM) (5) Definite (WOM) (5)	Long term (WM) (4) Long term (WM) (4)	Local (WOM) (1) Local (WM) (1)	High (WOM) (8) Medium (WM) (6)	High (65)	Moderate (55)
Habitat destruction	Negative	Definite (WOM) (5) Definite (WOM) (5)	Medium Term (WOM)(3) Medium Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	High (WOM) (8) Medium (WM) (6)	Moderate (60)	Moderate (50)
Spread of alien and invader plant species	Negative	Probable (WOM) (2) Probable (WM) (2)	Permanent (WOM) (5) Short Term (WM) (1)	Local (WOM) (1) Local (WM) (1)	Low (WOM) (2) Low (WM) (2)	Negligible (16)	Negligible (8)
Disturbance of fauna and fauna fatalities	Negative	Highly probable (WOM) (4) Highly probable (WM) (4)	Long Term (WOM)(4) Medium Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (44)	Low (24)
Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)
Pollution	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Regional (WOM) (3) Site (WM) (2)	Medium (WOM) (6) Low (WM) (2)	High (65)	Low (28)

Loss or fragmentation of indigenous natural fauna and flora	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	Very High (4)	High (3)
Reversibility	Barely reversible (3)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	High cumulative impacts (4)	
<b>Significance</b>	<b>Negative very high (76)</b>	<b>Negative High (51)</b>
Can impacts be mitigated?	<p>If the development is approved, contractors must ensure that no mammalian species are disturbed, trapped, hunted or killed. If the development is approved, every effort should be made to confine the footprint to the blocks allocated for the development and have the least possible edge effects on the surrounding area. The EMPr also provides numerous mitigation measures – refer to section (f) of the EMPr.</p> <p>The potential impacts associated with damage to and loss of farmland should be effectively mitigated. The aspects that should be covered include:</p> <ul style="list-style-type: none"> <li>• The site should be fenced off prior to commencement of construction activities;</li> <li>• The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be confined to the fenced off area and minimised where possible;</li> <li>• An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;</li> <li>• All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;</li> <li>• The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. Specifications for the rehabilitation are provided throughout the EMPr – section (f) of the EMPr.</li> <li>• The implementation of the Rehabilitation Programme should be monitored by the ECO.</li> </ul> <p><u>Mitigation measures</u></p> <ul style="list-style-type: none"> <li>• Supervision by an ecologist to ensure success of the rescue operation</li> <li>• Use already available farm roads to avoid trampling any possible red listed plant species</li> <li>• Vegetation clearing areas should be kept to a minimum and restricted to the proposed mining activities sites.</li> <li>• Exposed areas should be rehabilitated with indigenous plants to the project area as soon as construction is finished.</li> <li>• Do not disturb nests, breeding sites or young ones. Do not attempt to kill or capture snakes unless directly threatening the safety of employees.</li> </ul>	

	<ul style="list-style-type: none"> <li>• Dogs or other pets are not allowed to the worksite as they are threats to the natural wild animal</li> <li>• A low speed limit should be enforced on site to reduce wild animal-vehicle collisions</li> <li>• No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site.</li> <li>• Severe contractual fines must be imposed and immediate dismissal on any contract employee who is found attempting to snare or otherwise harms remaining faunal species.</li> <li>• Hunting weapons are prohibited on site.</li> <li>• Contract employees must be educated about the value of wild animals and the importance of their conservation.</li> <li>• The ECO must conduct regular site inspections of removing any snares or traps that have been erected.</li> <li>• Employees and contractors should be made aware of the presence of, and rules regarding, flora and fauna through suitable induction training and on-site signage.</li> <li>• Ensure that the colours used to paint the buildings including the roof are blending to the environment</li> </ul>
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- Loss destruction or fragmentation of habitats – The project site is situated in an agricultural area. Most of the arable land is used for crop production. Portions of the region have been transformed by mining and residential developments.

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

**5. DESCRIPTION AND ASSESSMENT OF ECOLOGICAL IMPACTS**

**5.1.1 List of impacts**

- **Removal of indigenous vegetation**

If mining activities expand into natural vegetation, indigenous vegetation will be removed. Loss of plant communities and flora species of significance may be caused due to the opencast mining activities, increased laydown area of the overburden and topsoil facilities, that used to represent natural vegetation communities. Rehabilitation of some areas would be possible but there is likely to be long-term disturbance in large areas.

- **Habitat destruction**

The clearance of vegetation will destroy the habitat of some species and may fragment other habitats.

- **Spread of alien and invader species**

Continued movement of personnel and vehicles on and off the site during the mining phase, will result in a risk of importation of alien species. Vehicles often transport many seeds and some may be of invader species, which may become established along the road, especially where the area is disturbed. The high levels of habitat disturbance also provide the greatest opportunities for invader species to establish themselves, since most indigenous species are less tolerant of disturbance. The spread of alien invasive plants on site is more INTENSE during the operational phase of the mine due to the movement of vehicles over an extended area on and from the site, causing a higher risk of potentially spreading the seeds or vegetative material from invasive species. Although construction creates the suitable conditions for establishment of invasive species, the operational phase certainly carries by far the greatest risk of alien invasive species being spread through the area. This risk is further influenced by increased run-off as a result of exposed areas and hardened surfaces created during the construction phase of the mine.

- **Disturbance of fauna and fauna fatalities**



Disturbance of remnant terrestrial wild mammal, avian, amphibian and insect fauna would probably occur through physical habitat destruction, noise, traffic and movement of people. The impact of the mining would be MODERATE to LOW considering that the area in general is already in a degraded state due to the surrounding mining activities and local communities. Therefore, animals would move away from the area, while some ground-burrowing species such as moles and reptiles might be killed in the process. Furthermore, opencast developments can threaten migration routes or flight paths as a result of noise and dust pollution. Cumulative impacts of illegal collecting, road kills or power line related deaths reduce population viability in the long-term. Some mining related habitats also favour species leading to un-natural competition with endemic fauna.

- **Soil erosion and sedimentation**

Vegetation prevents soil erosion. Once it is removed, soil erosion can occur. The increased hardened surfaces around infrastructure and exposed areas created alongside the open pit, as well as the roads and additional surface areas created on the slopes of the stockpiles and overburden facility will have a definite impact on the potential erosion of exposed areas

- **Pollution**

Exposure of rocks, ore and soils to rainfall and wind may lead to atmospheric contamination from dust and increased erosion of the site and sedimentation of local water courses. An increase in the movement of construction vehicles will result in an increase in the dust levels in the area. The environmental impacts of wind-borne dust, gases and particulates from the mining activities will have an impact on the vegetation of the area when dust settles on plant material reducing the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity and growth.

Heavy machinery and vehicles as well as sewage and domestic waste would be the main contributors to potential pollution problems relating to soil and water pollution on the project site.

### 5.1.3 Impact assessment

The impact assessment is given in Table 19 Impacts are assessed with mitigation (WM) and without mitigation (WOM).

Table 19: Impact assessment

Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM
Removal of indigenous vegetation	Negative	Definite (WOM) (5) Definite (WOM) (5)	Long term (WM) (4) Long term (WM) (4)	Local (WOM) (1) Local (WM) (1)	High (WOM) (8) Medium (WM) (6)	High (65)	Moderate (55)
Habitat destruction	Negative	Definite (WOM) (5) Definite (WOM) (5)	Medium Term (WOM)(3) Medium Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	High (WOM) (8) Medium (WM) (6)	Moderate (60)	Moderate (50)
Spread of alien and invader plant species	Negative	Probable (WOM) (2) Probable (WM) (2)	Permanent (WOM) (5) Short Term (WM) (1)	Local (WOM) (1) Local (WM) (1)	Low (WOM) (2) Low (WM) (2)	Negligible (16)	Negligible (8)
Disturbance of fauna and fauna fatalities	Negative	Highly probable (WOM) (4) Highly probable (WM) (4)	Long Term (WOM)(4) Medium Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (44)	Low (24)
Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)
Pollution	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Regional (WOM) (3) Site (WM) (2)	Medium (WOM) (6) Low (WM) (2)	High (65)	Low (28)

Loss or fragmentation of habitats	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Barely reversible (3)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	High cumulative impacts (4)	
<b>Significance</b>	<b>Negative High (54)</b>	<b>Negative Medium (32)</b>

<p>Can impacts be mitigated?</p>	<p>Exotic and invasive plant species should not be allowed to establish, if the development is approved. Where exotic and invasive plant species are found at the site continuous eradication should take place. If the development is approved, every effort should be made to confine the footprint to the blocks allocated for development – section (f) of the EMP also provides numerous mitigation measures related to fauna and flora.</p> <p><u>Mitigation measures</u></p> <ul style="list-style-type: none"> <li>• Do not disturb nests, breeding sites or young ones. Do not attempt to kill or capture snakes unless directly threatening the safety of employees.</li> <li>• Dogs or other pets are not allowed to the worksite as they are threats to the natural wild animal</li> <li>• A low speed limit should be enforced on site to reduce wild animal-vehicle collisions</li> <li>• Speed humps will need to be in place in order to assist in restricting truck drives from speeding</li> <li>• No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site.</li> <li>• Severe contractual fines must be imposed and immediate dismissal on any contract employee who is found attempting to snare or otherwise harms remaining faunal species.</li> <li>• Hunting weapons are prohibited on site.</li> <li>• Contract employees must be educated about the value of wild animals and the importance of their conservation.</li> <li>• The ECO must conduct regular site inspections of removing any snares or traps that have been erected.</li> <li>• Employees and contractors should be made aware of the presence of, and rules regarding, flora and fauna through suitable induction training and on-site signage.</li> <li>• Ensure that the colours used to paint the buildings including the roof are blending to the environment</li> </ul>
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- Loss of topsoil –Topsoil may be lost due to poor topsoil management (burial, erosion, etc.). The effect will be the loss of soil fertility on disturbed areas after rehabilitation. This will result in potential cultivation being lost.

Once the vegetation is removed, the topsoil will be removed and stored at a designated area.

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

<p><b><u>DESCRIPTION AND ASSESSMENT OF ECOLOGICAL IMPACTS</u></b></p> <ul style="list-style-type: none"> <li>• <i>Soil erosion and sedimentation</i></li> </ul> <p><i>Vegetation prevents soil erosion. Once it is removed, soil erosion can occur. The increased hardened surfaces around infrastructure and exposed areas created alongside the open pit, as well as the roads and additional surface areas created on the slopes of the stockpiles and overburden facility will have a definite impact on the potential erosion of exposed areas.</i></p> <p><b>5.1.3 Impact assessment</b></p> <p><i>The impact assessment is given in Table 19 Impacts are assessed with mitigation (WM) and without mitigation (WOM).</i></p>
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Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM
Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)

Loss of topsoil	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Geographical extent	Site (1)	Site (1)
Probability	Possible (2)	Possible (2)
Duration	Long term (3)	Medium term (2)
Magnitude	High (3)	Medium (2)
Reversibility	Barely reversible (3)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	High cumulative impacts (4)	
<b>Significance</b>	<b>Negative medium (48)</b>	<b>Negative low (26)</b>
Can impacts be mitigated?	<p>The following mitigation or management measures are provided:</p> <ul style="list-style-type: none"> <li>• If an activity will mechanically disturb below surface in any way, then any available topsoil should first be stripped from the entire surface and stockpiled for re-spreading during rehabilitation.</li> <li>• Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.</li> <li>• Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.</li> <li>• During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.</li> <li>• Erosion must be controlled where necessary on top soiled areas.</li> </ul> <p>Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.</p> <ul style="list-style-type: none"> <li>• Record the GPS coordinates of each area.</li> <li>• Record the date of topsoil stripping.</li> <li>• Record the GPS coordinates of where the topsoil is stockpiled.</li> <li>• Record the date of cessation of constructional (or operational) activities at the particular site.</li> <li>• Photograph the area on cessation of constructional activities.</li> <li>• Record date and depth of re-spreading of topsoil.</li> <li>• Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</li> </ul> <p>Section (f) of the EMPr also provide mitigation measures related to topsoil management.</p>	

- Soil erosion – Soil erosion due to alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal and the establishment of roads. Erosion will cause loss and deterioration of soil resources. This will result in grazing and cultivation potential being lost.

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

**DESCRIPTION AND ASSESSMENT OF ECOLOGICAL IMPACTS**

- *Soil erosion and sedimentation*

*Vegetation prevents soil erosion. Once it is removed, soil erosion can occur. The increased hardened surfaces around infrastructure and exposed areas created alongside the open pit, as well as the roads and additional surface areas created on the slopes of the stockpiles and overburden facility will have a definite impact on the potential erosion of exposed areas.*

**5.1.3 Impact assessment**

The impact assessment is given in Table 19 Impacts are assessed with mitigation (WM) and without mitigation (WOM).

Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM
Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)

Soil erosion	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Geographical extent	Site (1)	Site (1)
Probability	Possible (2)	Possible (2)
Duration	Long term (3)	Medium term (2)
Magnitude	High (3)	Medium (2)
Reversibility	Barely reversible (3)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	High cumulative impacts (4)	
<b>Significance</b>	<b>Negative medium (48)</b>	<b>Negative low (26)</b>
Can impacts be mitigated?	<ul style="list-style-type: none"> <li>• The following mitigation or management measures are provided: Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.</li> <li>• Monitor the area regularly after larger rainfall events to determine where erosion may be initiated and then mitigate by modifying the soil micro-topography and revegetation or soil erosion control efforts accordingly.</li> </ul> <p>Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records the occurrence any erosion on site or downstream – refer to section (f) of the EMP.</p>	

- Temporary noise disturbance - Preparation activities will result in the generation of noise over a period of months. Sources of noise are likely to include vehicles, the use of machinery such as back actors, wash plant, people working on the site and blasting. The noise impact is unlikely to be significant as there a current prospecting activity occurring on site and there are mines surrounding the proposed mining right area.

The possible noise and increased ground vibration during blasting and mine activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles, compliance to the Local Noise Regulations, and the International Finance Corporation’s Environmental Health and Safety Guidelines.

Industrial / Commercial noise impacts should not exceed the levels presented in Table below of South African Standards or result in a maximum increase above background levels of 3 dBA at the nearest receptor location off-site.

The noise levels are relevant to noise impacts beyond the property boundary of the facility. However, noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. A point of reception or receptor may be defined as any point on the premises occupied by persons where extraneous noise and/or vibration are received.

South African National Standard (SANS) 10103 (2008) provides a guideline for estimating community response to an increase in the general ambient noise level caused by intruding noise.

SITE	WHO / IFC LAEQ (1H) DBA		SOUTH AFRICAN STANDARDS	
	DAY 07:00 – 19:00	NIGHT 19:00 – 07:00	DAY 07:00 – 19:00	NIGHT 19:00 – 07:00
	Residential; Institutional; Educational	55	45	55
Industrial, Commercial	70	70	70	60

The possible noise and increased ground vibration during blasting and mine activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles, compliance to the Local Noise Regulations, and the International Finance Corporation’s Environmental Health and Safety Guidelines.

Temporary noise disturbance	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Possible (2)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	High cumulative impact (4).	
<b>Significance</b>	<b>Negative Medium (48)</b>	<b>Negative low (28)</b>
Can impacts be mitigated?	Yes, management actions related to noise pollution are included in section (f) of the EMP.	

- **Generation of waste - general waste, construction waste, sewage and grey water** - The workers on site are likely to generate general waste such as food wastes, packaging, bottles, etc. The applicant will need to ensure that general waste is appropriately disposed of i.e. taken to the nearest licensed landfill.

No further sanitation infrastructure is envisioned for the proposed mining right application, infrastructure were constructed during the approved prospecting right & amendment application.

No pit latrines, French drain systems or soak away systems shall be allowed.

Generation of waste	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local/district (2)	Local/district (2)
Probability	Probable (3)	Possible (2)
Duration	Medium term (2)	Medium term (2)
Magnitude	Medium (2)	Low (1)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)

Cumulative impact	Low cumulative impact (2) - An additional demand for landfill space could result in significant cumulative impacts if services become unstable or unavailable, which in turn would negatively impact on the local community. If general waste is left on site livestock could mistakenly eat it, which might in turn harm or kill them.	
<b>Significance</b>	<b>Negative low (24)</b>	<b>Negative low (11)</b>
Can impacts be mitigated?	Yes, it is therefore important that all management actions and mitigation measures included in section (f) of the EMP are implemented.	

- **Impacts on heritage objects**

A Phase 1 Heritage Impact Assessment was conducted by Palaeo Field Services, the report is available under **Appendix 11**.

Please see the findings below:

**Locality data**

The study area was divided into three zones for the purpose of the report, which combined, covers approximately 300 ha of relatively flat agricultural land and severely degraded mining areas (Fig. 3).

General Site Coordinates:

Area 1) 25°43'17.95"S 27°35'19.56"E

Area 2) 25°43'59.31"S 27°35'17.35"E

Area 3) 25°44'26.99"S 27°35'24.89"E



Figure 3: Layout of site according to descriptions in report

**Field Assessment**

Area 1 has been impacted by ongoing mining activities, as witnessed by multiple excavation, diggings and overgrown rubble heaps (Fig. 7). Areas 2 and 3 have been altered by ongoing farming activities (Fig. 8 & 9). A foot survey and has indicated no evidence for Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no evidence of Iron Age structures, rock engravings or historical buildings older than 60 years within the study areas. A large cemetery is located near the northern boundary of Area 1 (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E; Fig.10 & 11).

**Impact Statement**

Palaeontologically insignificant Bushveld Complex granites that are capped by superficial (Quaternary) deposits considered to be of low palaeontological sensitivity underlie the study area. The study area is located within a region that is known for rock engraving sites and that bears rich archaeological as well as historical evidence of early migration, fission and subsequent

development of early Sotho-Tswana people, leading to the establishment of numerous Iron Age settlements and complexes. However, the field assessment has indicated there is no above-ground evidence of prehistoric structures, historical buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the demarcated area (Table 1). The cemetery is rated Local Significance (Grade 3A). The rest of the development footprint is rated Generally Protected C (GP.C).

**Recommendations**

According to Section 36(3) of the National Heritage Resources Act 25 of 1999 no person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

It is recommended that the graveyard is included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a 20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities. It will be necessary to ensure that the graveyard is accessible to the relatives of the deceased.

Impacts on heritage objects	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Unlikely (1)
Duration	Short term (1)	Short term (1)
Magnitude	High (3)	Medium (2)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impact (2). Should these impacts occur, there may be a cumulative impact on the preservation of heritage objects in the area.	
<b>Significance</b>	<b>Negative High (45)</b>	<b>Negative low (24)</b>
Can impacts be mitigated?	<p>If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. Also refer to section (f) of the EMP.</p> <p>The following shall apply:</p> <ul style="list-style-type: none"> <li>• Known sites should be clearly marked in order that they can be avoided during construction activities.</li> <li>• The contractors and workers should be notified that archaeological sites might be exposed during the construction activities.</li> <li>• Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible;</li> <li>• All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;</li> <li>• Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and</li> </ul>	

	<ul style="list-style-type: none"> <li>Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51. (1).</li> </ul> <p>In order to achieve this, the following should be in place:</p> <ul style="list-style-type: none"> <li>A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage.</li> <li>Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer as identified above.</li> <li>In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures.</li> </ul>
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**Indirect impacts:** The nuisance aspects generally associated with the installation of infrastructure or ground preparation will also be applicable to this development, which relates primarily to the increase in vehicle traffic associated with mining practices, the influx of job seekers to the area, risk to safety, livestock and farm infrastructure, and increased risk of veld fires.

- Increase in vehicle traffic** – The movement of heavy vehicles have the potential to damage local roads and create dust and safety impacts for other road users in the area.

An access road will be established using an existing intersection. The costing of the access roads is included in the mining contractor’s site establishment costing (**Appendix 9, MWP**). The existing road, stretching ±900m North from the intersection to Bila Civil’s entrance, and is also used by Samancor or Samancor contractors.

The volume of traffic along this road is medium to high and the movement of heavy vehicles along this road is likely to damage the road surface and impact on other road users.

Increase in vehicle traffic	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Possible (2)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Low cumulative impact (2).  The N4 National Road is at approximately 1502m from the pit area and the D314 Road at 2741 m. The R104 road is at closest distance of 3328m from the pit area. No specific consideration regarding effects from blasting operations ground vibration and air blast will be required for these roads. The gravel roads on the northern and eastern side of the pit area are located such that when blasting is done within 500 m from these roads, travel management will be required. Stop and Go procedures during blasting will be required.	
<b>Significance</b>	<b>Negative Medium (42)</b>	<b>Negative low (24)</b>
Can impacts be mitigated?	The potential impacts associated with heavy vehicles can be effectively mitigated. The mitigation measures include:	



	<ul style="list-style-type: none"> <li>• The contractor must ensure that damage caused by construction on the off-gravel roads. The costs associated with the repair must be borne by the contractor;</li> <li>• Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;</li> <li>• All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.</li> <li>• Speed humps will need to be in place in order to assist in restricting truck drives from speeding</li> </ul> <p>Also refer section (f) of the EMP. For mitigation measures related to traffic.</p>
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• Risk to safety, crop production and farm infrastructure –

The presence on and movement of workers on and off the site poses a potential safety threat to local farmer's, farm workers and the communities in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged or stock theft linked either directly or indirectly to the presence of mine workers on the site.

However, impact is expected to be insignificant as there as existing prospecting activities occurring on the proposed mining right area. The mining activities is focused on the Northern section of the application area.

Risk to safety, livestock and farm infrastructure	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Possible (2)	Possible (2)
Duration	Medium term (2)	Medium term (2)
Magnitude	High (3)	medium (2)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	Marginal loss of resource (2)	No loss of resource (1)
Cumulative impact	Low cumulative effects (2), provided losses are compensated for.	
<b>Significance</b>	<b>Negative Medium (30)</b>	<b>Negative low (18)</b>
Can impacts be mitigated?	Key mitigation measures include: <ul style="list-style-type: none"> <li>• <b>Bila Civil Contractors (Pty) Ltd</b> should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;</li> <li>• The construction area should be fenced off prior to the commencement of the construction phase. The movement of construction workers on the site should be confined to the fenced off area;</li> <li>• Contractors appointed by <b>Bila Civil Contractors (Pty) Ltd</b> should provide daily transport for low and semi-skilled workers to and from the site. This</li> </ul>	

	<p>would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;</p> <ul style="list-style-type: none"> <li>• <b>Bila Civil Contractors (Pty) Ltd</b> should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities (see below);</li> <li>• The Environmental Management Programme (EMPr) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;</li> <li>• Contractors appointed <b>Bila Civil Contractors (Pty) Ltd</b> must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.</li> <li>• Contractors appointed by <b>Bila Civil Contractors (Pty) Ltd</b> must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;</li> </ul>
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- Increased risk of veld fires - The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could in turn pose a threat to livestock, crops, wildlife, farmsteads and other mines in the vicinity and infrastructure in the area.

In the process, infrastructure may also be damaged or destroyed, and human lives threatened. The potential risk of grass fires was heightened by the windy conditions in the area, especially during the dry, windy winter months from May to October. Fire-fighting equipment should be provided on site during the construction phase.

Increased risk of veld fires	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Region (3)	Local (2)
Probability	Probable (3)	Possible (2)
Duration	Medium term (2)	Medium term (2)
Magnitude	Very high (4)	Medium (2)
Reversibility	Irreversible (4)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	Negligible cumulative effects (1), provided losses are compensated for.	
<b>Significance</b>	<b>Negative high (64)</b>	<b>Negative low (22)</b>
Can impacts be mitigated?	<p>The mitigation measures include:</p> <ul style="list-style-type: none"> <li>• A fire-break should be constructed around the perimeter of the site prior to the commencement of the construction phase;</li> <li>• Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;</li> <li>• Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind</li> </ul>	

	<p>conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;</p> <ul style="list-style-type: none"> <li>• Contractor to provide adequate firefighting equipment on-site, including a fire fighting vehicle;</li> <li>• Contractor to provide fire-fighting training to selected construction staff;</li> <li>• No construction staff, with the exception of security staff, to be accommodated on site over night;</li> <li>• As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities.</li> </ul>
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- Increased groundwater impact–

A Geohydrological investigations was undertaken by Afri GS 95 (Pty) Ltd, the report is available under **Appendix 11**. Please see the findings below:

<p><b>3.10. Short &amp; long term potential groundwater abstraction impact on existing users</b>  <i>Groundwater abstraction yield estimates as derived from the FC and Cooper Jacob Methods are conservative and as such groundwater drawdown is expected to be between 5 – 10 m at the recommended duty cycles. There is no severe groundwater impact on groundwater levels expected in the immediate vicinity of the Mine. However, further study in the form of a numerical groundwater model is recommended to evaluate long term groundwater potential impacts on groundwater levels and aquifer storage.</i></p> <p><b>4.3.2. Groundwater piezometric contour map &amp; flow direction</b>  <i>Groundwater generally flows in a north westerly (NNW) direction through the study area. Groundwater also appears to flow in the direction of the major drainage features within the project area.</i></p> <p><i>Chrome mining &amp; processing activities generally have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe3+ (mg/l), Free chlorine Cl- (mg/l), High range nitrogen NO3- (mg/l), Low range phosphate PO4 2- (mg/l), Sulphates PO42- (mg/l) and Chromium (total) Cr (mg/l). It is thus, recommended, to drill at least two monitoring boreholes. One upstream and the other downstream of the study site. The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa &amp; Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.</i></p> <p><b>4.4. Groundwater potential contaminants</b>  <i>The activity of exploiting chromium mines may have significant adverse impacts on the quality indicators of surface water and groundwater, as well as the contamination with chromium element as a result of excavation and excision of chrome ore inside the plant, as well as the rinsing of mineral stocks in storage facilities and sterile wastes loaded with Cr dust. Mining waste water if not treated has the potential of contaminating groundwater &amp; is capable of destroying ecosystems relying on groundwater systems. The water coming out of the mines is usually limestone water, rich in chromium, and if emitted to the environment uncontrollably will flow into surface water or infiltrates through rock fractures into groundwater resources.</i></p> <p><i>Chrome mining &amp; processing activities have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe3+ (mg/l), Free chlorine Cl- (mg/l), High range nitrogen NO3- (mg/l), Low range phosphate PO4 2- (mg/l), Sulphates PO4 2- (mg/l) and Chromium (total) Cr (mg/l).</i></p> <p><b>4.5. Groundwater quality &amp; monitoring requirements</b>  <i>Baseline groundwater quality for the existing boreholes is as indicated in Table 7. It is also recommended to drill at least two groundwater monitoring boreholes at the locations indicated in Figure 8 below. The proposed downstream borehole</i></p>
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*will monitor any possible groundwater contamination into neighbouring streams & tributaries. The upstream borehole is considered a control borehole located further away from Mine activities.*

*Depending on the guidelines of the regulating authority, it is recommended to conduct groundwater level monitoring on a weekly basis. Macro chemical analysis within the project area and within a 1 km zone of the mine, can be conducted after every three months or on a bi-annual basis.*

**4.6. Potential Impact on neighbouring streams & groundwater dependent ecosystems**

*It is recommended to drill at least two monitoring boreholes as per section 4.5. A full chemical analysis should be conducted at these proposed monitoring boreholes to establish baseline water chemistry. Additional testing should be conducted for Acidity (pH), Temperature (oC), High range Iron Fe3+ (mg/l), Free chlorine Cl- (mg/l), High range nitrogen NO3- (mg/l), Low range phosphate PO4 2- (mg/l), Sulphates PO4 2- (mg/l) and Chromium (total) Cr (mg/l). Groundwater chemistry over a period of time will determine the potential impact on the environment & serve as an evaluation tool of the waste water treatment efficiency employed by the mine.*

A Water Use License Application (WULA) was submitted to DWS for the mining activities.

Increased consumption of water	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (2)
Magnitude	High (3)	Medium (2)
Reversibility	Barely (3)	Partly (2)
Irreplaceable loss of resources	Significant loss of resources (3)	Marginal loss of resources (2)
Cumulative impact	Medium cumulative impacts (3) - An additional demand on water sources could result in a significant cumulative impact with regards to the availability of water.	
<b>Significance</b>	<b>Negative High (54)</b>	<b>Negative Medium (30)</b>
Can impacts be mitigated?	Yes.	

- **Air quality:**

An Air Quality Impact Assessment (AQIA) was conducted by Rayten Engineering Solutions (Pty) Ltd. The report is available under **Annexure 11**. The report states the source of emissions during the construction phase is area source activities such as construction activity (limited to development/expansion of infrastructure, e.g. access roads, PCDs & stockpile areas) to cater for the planned full capacity of operation.) Please see the table below:

*It is noted that construction activity at the proposed mine will be limited to the development/expansion of infrastructure to cater for the planned full capacity of operation at the mine. Part of the infrastructure required for the proposed mine has already been developed/constructed as part of the work undertaken during the bulk sampling activities and trial mining.*

*The dispersion model output plots for dustfall rates, PM10 and PM2.5 concentrations due to activities associated with construction at the proposed mine are given in Figure 5-1 to Figure 5-5.*

*It should be noted that the USEPA emission factor used to quantify emissions associated with construction activity is referenced to TSP and assumes that the construction activity occurs over 30 days. Therefore, use of this emission factor to estimate emissions of TSP and PM10 does result in conservatively high estimates. Dustfall rates and PM10 concentrations due to construction activity at the proposed mine may be slightly lower in reality.*

*Predicted incremental dustfall rates and PM concentrations under the construction phase are relatively low and mostly in compliance with the applicable standards over the project area modelled (i.e. the area within the 20m x 20m modelling domain). Higher concentrations, including exceedances of the residential and non-residential area standards of 600 mg/m<sup>2</sup>/day and 1 200 mg/m<sup>2</sup>/day for dustfall, as well as the daily and annual standards of 75 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup> for PM10, respectively, are projected over small areas inside the facility boundary (Figure 5-1 to Figure 5-3), as well as along a small section of the south-eastern boundary for PM10 (Figure 5-2 and Figure 5-3). For PM2.5, no exceedances of the daily and annual PM2.5 standards of 40 µg/m<sup>3</sup> and 20 µg/m<sup>3</sup>, respectively, are projected (Figure 5-4 and Figure 5-5).*

*Background PM10 and PM2.5 concentrations at the project site are high, with several exceedances of the daily and annual PM10 and PM2.5 NAAQS recorded over the January 2020 – December 2022 monitoring period at the Marikana AQMS, as seen in Sections 4.2.1 and 4.2.2. However, based on predicted concentrations for the construction phase, which are relatively low, the proposed mine is not expected to be a significant source of incremental PM10 and PM2.5 concentrations in the area during the construction phase.*

*Maximum predicted incremental dustfall rates and PM concentrations at nearby sensitive receptors located within 10km from the proposed mine boundary are low for the construction phase (Table 5-14). The maximum predicted incremental PM10 and PM2.5 concentrations and dustfall rates at the boundary of the proposed mine are given in Table 5-16 for the construction phase.*

**Table 5-19: Rating of Air Quality Impacts associated with mining activities at the proposed mine – Construction Phase.**

POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE AREA	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION										
			E	P	R	L	D	C	M	TOTAL	STATUS		SP	E	P	R	L	D	C	M	TOTAL	STATUS	SP
AREAS: 1. Mine Infrastructure Area; 2. Stockpile Yards																							
CONSTRUCTION PHASE ACTIVITIES: 1. Construction activities																							
<b>Air Quality: Construction Phase</b>																							
Dustfall - daily	1	1	2	4	3	2	2	3	2	32	-	M	Refer to Table 6-2 in AQIA report	1	3	2	2	2	2	2	24	-	L
PM10 - daily	1	1	2	4	3	2	2	3	2	32	-	M	Refer to Table 6-2 in AQIA report	1	3	2	2	2	2	2	24	-	L
PM10 - annual	1	1	2	4	3	2	2	3	2	32	-	M	Refer to Table 6-2 in AQIA report	1	3	2	2	2	2	2	24	-	L
PM2.5 - daily	1	1	2	4	3	2	2	3	2	32	-	M	Refer to Table 6-2 in AQIA report	1	3	2	2	2	2	2	24	-	L
PM2.5 annual	1	1	2	4	3	2	2	3	2	32	-	M	Refer to Table 6-2 in AQIA report	1	3	2	2	2	2	2	24	-	L

- Ecology of ecology of watercourses

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

**7.4.1 Construction Phase**

During the construction phase the concern is over vegetation and topsoil clearing and moved over the proposed open pit areas. This will be over a sequential basis as the extension occurs and therefore the entire area will not be exposed within the same timeframe. The result of the removal of vegetation and topsoil is increased runoff velocities and the subsequent erosion and sedimentation of local waterbodies. In addition, runoff from topsoil stockpiles are anticipated to contain high levels of suspended material. Associated infrastructure with the mining will be constructed during this phase such as access roads and haul roads to be used during operation. The storage and utilisation of construction materials (concrete, fuel, stockpiles) present risk to degrade local water quality. The storage and handling of waste such as domestic and miscellaneous construction waste, also presents risk to local water and habitat quality.

**7.4.1.1 Mitigation**

- It is proposed that the southern tributary is diverted around active workings;
- It is proposed that the extent of the open pit within the 100m buffer is realigned;
- All riparian buffer areas must be avoided;
- Areas where construction is to take place must be clearly demarcated. Any areas not demarcated must be completely avoided;
- Stockpiling or storage of materials and/or waste must be placed beyond the defined buffers for each respective activity and clearly demarcated;
- Tarps must be used to cover stockpiles when not in use;
- Barriers and berms to capture runoff from both the construction areas as well as the topsoil stockpiles must be implemented;

- No vehicles are to be serviced on open site, a suitable workshop with appropriate pollution control facilities should be utilised offsite;
- Suitable stormwater and groundwater management, which will reduce erosion and sedimentation, must be established and implemented per pit. The implementation of said plans should be audited annually;
- All fuels must be stored in a suitable storage device on an impermeable surface outside of the delineated buffer zones; and
- All vehicle operators should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;

Table 19: DWS Risk Impact Matrix for the proposed project continued

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
<b>Construction Phase</b>								
Vegetation and topsoil clearing	2	2	1	2	7	43.75	Low*	Low*
Construction of associated infrastructure such as access and haul roads	2	2	1	1	6	36	Low*	Low*
Bulk material storage and handling	1	1	1	2	5	21.25	Low*	Low*

Mitigation measures are included in the Environmental Management Programme (EMPr).

**OPERATIONAL PHASE**

**Direct impacts:** During the operational phase the study area will serve as a mining area and the impacts are generally associated with soil erosion, change in land use, impacts associated with the, increase in storm water runoff, increased consumption of water, visual intrusion, the generation of general waste, leakage of hazardous materials, and the change in the sense of place. The operational phase will also have a direct positive impact through the provision of permanent employment opportunities and facilitating a positive economic growth. The abovementioned impacts are discussed in more detail below:

- **Soil erosion** – The largest risk factor for soil erosion will be during the operational phase when the mining activity ensues and soil is left bare until rehabilitation is initiated. Erosion will be localised within the site. This will ultimately lead to the irretrievable commitment of this resource. The measurable effect of reducing erosion by utilizing mitigation measures may reduce possible erosion significantly

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

<b>DESCRIPTION AND ASSESSMENT OF ECOLOGICAL IMPACTS</b>																							
<ul style="list-style-type: none"> <li>• <i>Soil erosion and sedimentation</i></li> </ul> <p><i>Vegetation prevents soil erosion. Once it is removed, soil erosion can occur. The increased hardened surfaces around infrastructure and exposed areas created alongside the open pit, as well as the roads and additional surface areas created on the slopes of the stockpiles and overburden facility will have a definite impact on the potential erosion of exposed areas.</i></p> <p><b>5.1.3 Impact assessment</b>  <i>The impact assessment is given in Table 19 Impacts are assessed with mitigation (WM) and without mitigation (WOM).</i></p> <table border="1"> <thead> <tr> <th>Impact</th> <th>Type</th> <th>Probability</th> <th>Duration</th> <th>Scale</th> <th>Magnitude / Severity</th> <th>Significance WOM</th> <th>Significance WM</th> </tr> </thead> <tbody> <tr> <td>Soil erosion</td> <td>Negative</td> <td>Definite (WOM) (5) Highly probable (WM) (4)</td> <td>Long Term (WOM)(4) Short Term (WM) (3)</td> <td>Local (WOM) (1) Local (WM) (1)</td> <td>Medium (WOM) (6) Low (WM) (2)</td> <td style="background-color: yellow;">Moderate (55)</td> <td>Negligible (12)</td> </tr> </tbody> </table>								Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM	Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)
Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM																
Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)																

<b>Soil erosion</b>	<b>Pre-mitigation impact rating</b>	<b>Post mitigation impact rating</b>
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Site (1)
Probability	Definite (4)	Possible (2)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources	Marginal loss of resource (2)	No loss of resource (1)
Cumulative impact	Low cumulative effects (2) should these impacts occur, there will be a cumulative impact on the air and water resources in the study area in terms of pollution.	
<b>Significance</b>	<b>Negative Medium (45)</b>	<b>Negative Low (20)</b>
Can impacts be mitigated?	Yes, to avoid soil erosion it will be a good practice to not remove all the vegetation at once but to only clear the area as it becomes necessary and to implement concurrent rehabilitation. <ul style="list-style-type: none"> <li>• The following mitigation or management measures are provided: Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.</li> <li>• Monitor the area regularly after larger rainfall events to determine where erosion may be initiated and then mitigate by modifying the soil micro-topography and revegetation or soil erosion control efforts accordingly</li> </ul>	



	Also refer to section (f) of the EMPr.
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- Change in land-use –

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102).

According to the maps below (**Figure 28** and **Figure 29**), the proposed area is largely covered by cultivation, natural vegetation, degraded land and mining.

As mentioned above the applicant has an existing Prospecting Right on the proposed area and the area identified as natural vegetation on the land use and land cover maps below is currently disturbed by the mining activities, please see google earth map (**Figure 30**).

Please see the below statement from the Terrestrial Biodiversity Impact Assessment conducted by AGES:

<i>The area is heavily disturbed by current prospecting activities on the northern part of the application area. Over the northern part of the application area there are mining related infrastructure, such as a workshop area, fence lines, mine roads and access roads to the prospecting area, dumps of various sizes and purposes, quarries and excavations. The central and southern part of the project area is currently utilised as agricultural land with cultivated fields and citrus orchards.</i>
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An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under **Appendix 11**. Please see the findings below:

<i>“the majority of the current land use of the land should be adjusted to reflect MINING ACTIVITIES (old and new) on a major disturbed area of 188 ha. The rest of the application area covers an surface area (area 1 &amp;2) that is used for AGRICULTURAL ACTIVITIES. The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural).</i>
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Change in land use	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Definite (4)	Probable (3)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Irreversible (4)	Partly reversible (2)
Irreplaceable loss of resources	Significant loss of resource (3)	Significant loss of resource (3)
Cumulative impact	High cumulative impacts (4)	
<b>Significance</b>	<b>Negative medium (38)</b>	<b>Negative medium (32)</b>
Can impacts be mitigated?	The proponent should establish a Rehabilitation Fund to be used to rehabilitate the area once the proposed facility has been decommissioned. The fund should be funded by revenue generated during the operational phase of the project. The motivation for the establishment of a Rehabilitation Fund is based on the experience in the mining sector where many mines on closure have not set aside sufficient funds for closure and decommissioning.  Also refer to section (f) of the EMPr.	

- Generation of alternative land use income – Income generated through the proposed mining right will provide the community with increased cash flow and livelihood, and thereby improve the financial sustainability of the community.

Generation of alternative land use income	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Geographical extent	Site (1)	Local (2)
Probability	Definite (4)	Definite (4)

Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Medium (2)
Reversibility	Completely reversible (1)	Completely reversible (1)
Irreplaceable loss of resources	No loss of resources (1)	No loss of resources (1)
Cumulative impact	Low cumulative impact (2).	
<b>Significance</b>	<b>Positive Low (24)</b>	<b>Positive Low (26)</b>
Can impacts be mitigated?	No mitigation required.	

- Increase in storm water runoff – The development will potentially result in an increase in storm water run-off that needs to be managed to prevent soil erosion, especially where vegetation will be cleared. Not all the vegetation should be removed at once. Only the specific trench being excavated at the specific time should be cleared.

A Water Use License Application (WULA) was submitted to DWS for the mining activities. A Stormwater Management Plan was submitted for the WULA.

<b>Increase in storm water runoff</b>	<b>Pre-mitigation impact rating</b>	<b>Post mitigation impact rating</b>
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Probable (3)	Possible (2)
Duration	Medium term (2)	Medium term (2)
Magnitude	High (3)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss of resource (2)	No loss of resource (1)
Cumulative impact	Low cumulative impact (2) - Should these impacts occur, there will be cumulative impacts on the wider area.	
<b>Significance</b>	<b>Negative medium (36)</b>	<b>Negative low (20)</b>
Can impacts be mitigated?	Yes. It is therefore important that all management actions and mitigation measures included in section (f) of the EMP. are implemented to ensure that these impacts do not occur	

- Increased consumption of water – A Water Use License Application (WULA) was submitted to DWS for the mining activities.

A Geohydrological investigations was undertaken by Afri GS 95 (Pty) Ltd, the report is available under **Appendix 11**. According to the report:

<ul style="list-style-type: none"> <li>• 24 Hour constant discharge tests have been conducted at two existing boreholes on the property &amp; pump test analysis has been done using the FC Method &amp; Cooper Jacob approximations.</li> <li>• Both boreholes are recommended for production processes at the Mine</li> <li>• The calculations for available water in aquifer storage indicate aquifer storage of 289 370.24 m<sup>3</sup></li> <li>• Sustainable aquifer yield calculations indicate an average sustainable yield on the property of 136.82 m<sup>3</sup>/day (i.e 1.58 l/sec).</li> </ul> <p><b>3.10. Short &amp; long term potential groundwater abstraction impact on existing users</b> Groundwater abstraction yield estimates as derived from the FC and Cooper Jacob Methods are conservative and as such groundwater drawdown is expected to be between 5 – 10 m at the recommended duty cycles. There is no severe groundwater impact on groundwater levels expected in the immediate vicinity of the Mine. However, further study in the form of a numerical groundwater model is recommended to evaluate long term groundwater potential impacts on groundwater levels and aquifer storage.</p>
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<b>Increased consumption of water</b>	<b>Pre-mitigation impact rating</b>	<b>Post mitigation impact rating</b>
Status (positive or negative)	Negative	Negative

Extent	Local (2)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (3)
Magnitude	High (3)	Medium (2)
Reversibility	Irreversible (4)	Irreversible (4)
Irreplaceable loss of resources	Major loss of resources (3)	Marginal loss of resources (2)
Cumulative impact	Medium cumulative impacts (3) - An additional demand on water sources could result in a significant cumulative impact with regards to the availability of water.	
<b>Significance</b>	<b>Negative High (57)</b>	<b>Negative medium (34)</b>
Can impacts be mitigated?	Yes, management actions and mitigation measures related to the use of water are included in section (f) of the EMP.	

- Increased groundwater impact –

A Geohydrological investigations was undertaken by Afri GS 95 (Pty) Ltd, the report is available under **Appendix 11**. Please see the findings below:

<ul style="list-style-type: none"> <li>• <i>Two boreholes were located within the project area and both were sampled for macro-chemical analysis. Water quality results suggest that groundwater at both boreholes is Class IV (Unacceptable quality) due to elevated Total hardness and magnesium.</i></li> <li>• <i>24 Hour constant discharge tests have been conducted at two existing boreholes on the property &amp; pump test analysis has been done using the FC Method &amp; Cooper Jacob approximations.</i></li> <li>• <i>Both boreholes are recommended for production processes at the Mine &amp; borehole equipping recommendations are as shown in Table 5.</i></li> </ul> <p><b>3.10. Short &amp; long term potential groundwater abstraction impact on existing users</b>  <i>Groundwater abstraction yield estimates as derived from the FC and Cooper Jacob Methods are conservative and as such groundwater drawdown is expected to be between 5 – 10 m at the recommended duty cycles. There is no severe groundwater impact on groundwater levels expected in the immediate vicinity of the Mine. However, further study in the form of a numerical groundwater model is recommended to evaluate long term groundwater potential impacts on groundwater levels and aquifer storage.</i></p> <p><b>4.3.2. Groundwater piezometric contour map &amp; flow direction</b>  <i>Groundwater generally flows in a north westerly (NNW) direction through the study area. Groundwater also appears to flow in the direction of the major drainage features within the project area.</i></p> <p><i>Chrome mining &amp; processing activities generally have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe3+ (mg/l), Free chlorine Cl- (mg/l), High range nitrogen NO3- (mg/l), Low range phosphate PO4 2- (mg/l), Sulphates PO42- (mg/l) and Chromium (total) Cr (mg/l). It is thus, recommended, to drill at least two monitoring boreholes. One upstream and the other downstream of the study site. The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa &amp; Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.</i></p> <p><b>4.4. Groundwater potential contaminants</b>  <i>The activity of exploiting chromium mines may have significant adverse impacts on the quality indicators of surface water and groundwater, as well as the contamination with chromium element as a result of excavation and excision of chrome ore inside the plant, as well as the rinsing of mineral stocks in storage facilities and sterile wastes loaded with Cr dust. Mining waste water if not treated has the potential of contaminating groundwater &amp; is capable of destroying ecosystems relying on groundwater systems. The water coming out of the mines is usually limestone water, rich in chromium, and if emitted to the environment uncontrollably will flow into surface water or infiltrates through rock fractures into groundwater resources.</i></p>
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*Chrome mining & processing activities have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe3+ (mg/l), Free chlorine Cl- (mg/l), High range nitrogen NO3- (mg/l), Low range phosphate PO4 2- (mg/l), Sulphates PO4 2- (mg/l) and Chromium (total) Cr (mg/l).*

**4.5. Groundwater quality & monitoring requirements**  
*Baseline groundwater quality for the existing boreholes is as indicated in Table 7. It is also recommended to drill at least two groundwater monitoring boreholes at the locations indicated in Figure 8 below. The proposed downstream borehole will monitor any possible groundwater contamination into neighbouring streams & tributaries. The upstream borehole is considered a control borehole located further away from Mine activities.*

*Depending on the guidelines of the regulating authority, it is recommended to conduct groundwater level monitoring on a weekly basis. Macro chemical analysis within the project area and within a 1 km zone of the mine, can be conducted after every three months or on a bi-annual basis.*

**4.6. Potential Impact on neighbouring streams & groundwater dependent ecosystems**  
*It is recommended to drill at least two monitoring boreholes as per section 4.5. A full chemical analysis should be conducted at these proposed monitoring boreholes to establish baseline water chemistry. Additional testing should be conducted for Acidity (pH), Temperature (oC), High range Iron Fe3+ (mg/l), Free chlorine Cl- (mg/l), High range nitrogen NO3- (mg/l), Low range phosphate PO4 2- (mg/l), Sulphates PO4 2- (mg/l) and Chromium (total) Cr (mg/l). Groundwater chemistry over a period of time will determine the potential impact on the environment & serve as an evaluation tool of the waste water treatment efficiency employed by the mine.*

A Water Use License Application (WULA) was submitted to DWS for the mining activities.

Groundwater impact	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Long term (3)	Long term (2)
Magnitude	High (3)	Medium (2)
Reversibility	Barely (3)	Partly (2)
Irreplaceable loss of resources	Significant loss of resources (3)	Marginal loss of resources (2)
Cumulative impact	Medium cumulative impacts (3) - An additional demand on water sources could result in a significant cumulative impact with regards to the availability of water.	
<b>Significance</b>	<b>Negative High (54)</b>	<b>Negative Medium (30)</b>
Can impacts be mitigated?	Yes. <ul style="list-style-type: none"> <li>It is thus recommended to drill at least two monitoring boreholes. One upstream and the other downstream of the study site.</li> </ul>	

- Generation of waste –Workers will be present on site 24hours/day, 7days/week. Sources of general waste will be waste food, packaging, paper, etc. General waste will be stored on the site and removed on a weekly basis.

On the proposed area is also a cafeteria thus the generation of waste will be localized to a specific area.

Generation of waste	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Definite (4)	Definite (4)
Duration	Medium term (2)	Medium term (2)
Magnitude	Low (1)	Low (1)
Reversibility	Partly reversible (2)	Partly reversible (2)

Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	Medium cumulative impact (3) - An additional demand for landfill space could result in significant cumulative impacts with regards to the availability of landfill space. If general waste is left on site livestock could mistakenly eat it, which might in turn harm or kill them.	
<b>Significance</b>	<b>Negative low (14)</b>	<b>Negative low (14)</b>
Can impacts be mitigated?	Yes, management actions related to waste management are included in section (f) of the EMP.	

- Leakage of hazardous materials - The proposed mining activity will make use of machinery that use fuel and oil. Leakage of these oils and fuel can contaminate water supplies and must be prevented by constructing oil and diesel permeable bunds to ensure that any spills are suitably attenuated and not released into the environment.

Leakage of hazardous materials	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Site (1)	Site (1)
Probability	Possible (2)	Unlikely (1)
Duration	Medium term (2)	Short term (1)
Magnitude	Medium (2)	Medium (2)
Reversibility	Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources	Significant loss of resource (3)	Marginal loss of resource (2)
Cumulative impact	The impact would result in negligible to no cumulative effects (1)	
<b>Significance</b>	<b>Negative low (22)</b>	<b>Negative low (14)</b>
Can impacts be mitigated?	Yes. It is therefore important that all management actions and mitigation measures included in the section (f) of EMP are implemented to ensure that these impacts do not occur.	

- Noise disturbance - Mining activities will result in the generation of noise over a period of ±20 years. Sources of noise are likely to include vehicles, the use of machinery, plants, blasting and people working on the site. The proposed area is also surrounded by mines on the North, East and West side.

The possible noise and increased ground vibration during blasting and mine activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles, compliance to the Local Noise Regulations, and the International Finance Corporation's Environmental Health and Safety Guidelines.

The following three 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;
- The receiver – Reduction of the noise at the receiver.

Increased noise levels are directly linked with the various activities associated with the construction of the proposed facility and related infrastructure, as well as the operational phase of the activity.

Temporary noise disturbance	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Probable (3)	Possible (2)
Duration	Long term (3)	Long term (3)
Magnitude	Medium (2)	Low (1)

Reversibility	Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources	Marginal loss of resource (2)	Marginal loss of resource (2)
Cumulative impact	Medium cumulative impact (3).	
<b>Significance</b>	<b>Negative High (30)</b>	<b>Negative low (13)</b>
Can impacts be mitigated?	Yes, management actions related to noise pollution are included in section (f) of the EMP.	

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- **Blasting and vibration** – Mining process will include blasting activities.

A Blast Impact Assessment was conducted by Blast Management & Consulting, the report is available under **Appendix 11**. Please see the findings below:

The quantification of impacts is calculated mainly for the Operational Phase. No specific blasting is expected for the Construction, Decommissioning and Post-closure phases.

**Table: Risk Assessment Outcome before mitigation**

No.	Receptor / Resource	Process / Activity	Environmental Impact	Nature and Status (positive (P), negative (N) or neutral (NT))	Extent	Duration	Magnitude	Probability	Significance		Mitigation and Management Measures
									Value	Rating	
1	Mine Buildings/Structures	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, using electronic initiation and single hole firing.
2	Dam	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	
3	Road	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	
4	Tailings Dam	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	
5	Samancor Tailings Dam	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	
6	Power Lines/Pylons	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	
7	Informal Settlement	Blasting	Ground Vibration	N	2	3	2	1	7	Very Low	
8	Houses	Blasting	Ground Vibration	N	2	3	2	1	7	Very Low	
9	Underground Workings	Blasting	Ground Vibration	N	2	3	8	4	52	Moderate	
10	Mine Buildings/Structures	Blasting	Air Blast	N	2	3	8	4	52	Moderate	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Use of specific stemming to manage fly
11	Dam	Blasting	Air Blast	N	2	3	6	1	11	Very Low	
12	Road	Blasting	Air Blast	N	2	3	6	1	11	Very Low	

13	Tailings Dam	Blasting	Air Blast	N	2	3	6	1	11	Very Low	rock - crushed aggregate of specific size. Re-design with increased stemming lengths.
14	Samancor Tailings Dam	Blasting	Air Blast	N	2	3	6	1	11	Very Low	
15	Power Lines/Pylons	Blasting	Air Blast	N	2	3	6	1	11	Very Low	
16	Informal Settlement	Blasting	Air Blast	N	2	3	6	3	33	Low	
17	Houses	Blasting	Air Blast	N	2	3	8	1	13	Very Low	
18	Underground Workings	Blasting	Air Blast	N	2	3	0	0	0	None	
19	Mine Buildings/Structures	Blasting	Fly Rock	N	2	3	8	5	65	High	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Use of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.
20	Dam	Blasting	Fly Rock	N	2	3	8	5	65	High	
21	Road	Blasting	Fly Rock	N	2	3	8	5	65	High	
22	Tailings Dam	Blasting	Fly Rock	N	2	3	4	5	45	Moderate	
23	Samancor Tailings Dam	Blasting	Fly Rock	N	2	3	4	5	45	Moderate	
24	Power Lines/Pylons	Blasting	Fly Rock	N	2	3	8	5	65	High	
25	Informal Settlement	Blasting	Fly Rock	N	2	3	8	2	26	Low	
26	Houses	Blasting	Fly Rock	N	2	3	8	1	13	Very Low	
27	Underground workings	Blasting	Fly Rock	N	2	3	0	0	0	None	



**Table: Risk Assessment Outcome after mitigation**

No.	Receptor / Resource	Process / Activity	Environmental Impact	Nature and Status (positive (P), negative (N) or neutral (NT))	Extent	Duration	Magnitude	Probability	Significance		Mitigation and Management Measures
									Value	Rating	
1	Mine Buildings/Structures	Blasting	Ground Vibration	N	2	3	6	3	33	Low	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, using electronic initiation and single hole firing.
2	Dam	Blasting	Ground Vibration	N	2	3	6	3	33	Low	
3	Road	Blasting	Ground Vibration	N	2	3	6	3	33	Low	
4	Tailings Dam	Blasting	Ground Vibration	N	2	3	6	3	33	Low	
5	Samancor Tailings Dam	Blasting	Ground Vibration	N	2	3	6	3	33	Low	
6	Power Lines/Pylons	Blasting	Ground Vibration	N	2	3	6	3	33	Low	
7	Informal Settlement	Blasting	Ground Vibration	N	2	3	1	1	6	Very Low	
8	Houses	Blasting	Ground Vibration	N	2	3	1	0	0	Very Low	
9	Underground Workings	Blasting	Ground Vibration	N	2	3	6	3	33	Low	
10	Mine Buildings/Structures	Blasting	Air Blast	N	2	3	6	3	33	Low	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.
11	Dam	Blasting	Air Blast	N	2	3	4	1	9	Very Low	
12	Road	Blasting	Air Blast	N	2	3	4	1	9	Very Low	
13	Tailings Dam	Blasting	Air Blast	N	2	3	4	1	9	Very Low	
14	Samancor Tailings Dam	Blasting	Air Blast	N	2	3	4	1	9	Very Low	
15	Power Lines/Pylons	Blasting	Air Blast	N	2	3	4	1	9	Very Low	

16	Informal Settlement	Blasting	Air Blast	N	2	3	4	2	18	Very Low	Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.
17	Houses	Blasting	Air Blast	N	2	3	6	0	0	Very Low	
18	Underground Workings	Blasting	Air Blast	N	2	3	0	0	0	None	
19	Mine Buildings/Structures	Blasting	Fly Rock	N	2	3	6	3	33	Low	
20	Dam	Blasting	Fly Rock	N	2	3	6	3	33	Low	
21	Road	Blasting	Fly Rock	N	2	3	6	3	33	Low	
22	Tailings Dam	Blasting	Fly Rock	N	2	3	2	3	21	Low	
23	Samancor Tailings Dam	Blasting	Fly Rock	N	2	3	2	3	21	Low	
24	Power Lines/Pylons	Blasting	Fly Rock	N	2	3	6	3	33	Low	
25	Informal Settlement	Blasting	Fly Rock	N	2	3	2	0	0	Very Low	
26	Houses	Blasting	Fly Rock	N	2	3	2	0	0	Very Low	
27	Underground workings	Blasting	Fly Rock	N	2	3	0	0	0	None	

Mitigation measures are included in the Environmental Management Programme (EMPr).

- **Air Quality:**

An Air Quality Impact Assessment (AQIA) was conducted by Rayten Engineering Solutions (Pty) Ltd. The report is available under **Annexure 11**. The report states the source of emissions during the operational phase is Area and Volume Source Activities such as:

- Drilling and blasting at the opencast pit (to break overburden and ROM);
- Bulldozing (moving material and shaping stockpiles);
- Material handling operations (truck loading/offloading operations);
- Conveyor transfer points;
- Transportation/hauling of ROM (trucks);
- Material storage: Stockpiling;
- Crushing and screening;
- Excavators and FELs (stripping ore and overburden and loading trucks);
- Wind erosion from exposed areas (i.e. exposed surfaces, and material stockpile areas); and
- Vehicle dust entrainment on unpaved roads.

Please see the table below:

*The dispersion model output plots for dustfall rates, PM10 and PM2.5 concentrations due to proposed surface mining activities associated with operations at the proposed mine are given in Figure 5-6 to Figure 5-10. Predicted incremental dustfall rates and PM concentrations under the actual operating scenario are high but mostly in compliance with applicable standards over the project area.*

*For dustfall and annual PM2.5, higher concentrations, including exceedances of the residential and non-residential area standards (for dustfall) and the annual NAAQS (for PM2.5) are projected near the proposed surface mining activities and beyond the proposed mine boundary to the south-west, north-west and south-east, within a 360m radius (Figure 5-6 and Figure 5-10). Dispersion patterns in predicted annual PM10 and daily PM2.5 concentrations are also similar, with predicted concentrations falling below the applicable NAAQS over most areas surrounding the proposed mine, except at areas north-west and north-east of the proposed mine, where exceedances of the NAAQS are projected up to 930m and 1.4km from the mine boundary for annual PM10 and daily PM2.5, respectively (Figure 5-8 and Figure 5-9). Predicted daily PM10 concentrations are projected to exceed the applicable limit beyond all sections of the mine boundary, especially north-west and north-east of the boundary where the exceedances extend up to a maximum radius of 5.3km from the boundary (Figure 5-7).*

*Based on predicted PM concentrations for the operational phase, which are high and well above applicable limits, the proposed mine is likely to be a significant source of incremental PM10 and PM2.5 concentrations in the area during the operational phase. Since background PM10 and PM2.5 concentrations at the project site are already high, with several exceedances of the daily and annual PM10 and PM2.5 NAAQS recorded over the January 2020 – December 2022 monitoring period at the Marikana AQMS, as seen in Sections 4.2.1 and 4.2.2, the proposed activities will likely result in high cumulative impacts.*

*Maximum predicted incremental dustfall rates and PM concentrations at nearby sensitive receptors located within 10km from the proposed mine boundary are given in Table 5-15 for the operational phase. None of the sensitive receptors are indicated to be impacted by projected exceedances in dustfall, PM2.5 and annual PM10 concentrations, while discrete receptors DR26*

(Machadam Combined School), DR27 (Elandsdrift dwellings) and DR28 (Mooinoi Bokamoso dwellings), which are all downwind of the proposed mining operations, fall within the sphere of projected exceedances for daily PM10 (Table 5-15).

Receptors DR26 – DR28 could be at risk since they are potentially already exposed to background emissions released from other nearby mining activities and waste and resource dumps in surrounding areas, e.g. Samancor Western Chrome (~400m west of the proposed mine), Tharisa mine and associated dumps (~8km west of the proposed mine), etc. Thus, it is recommended that the proposed mine manage and mitigate dustfall and PM emissions associated with proposed surface mining activities as far as possible to minimise the impact on these receptors.

The maximum predicted incremental PM10 and PM2.5 concentrations and dustfall rates at the boundary of the proposed mine are given in Table 5-17 for the operational phase.

**Cumulative Impacts**

The Bila Elandsdraal Mine is a proposed facility, with only trial mining currently being conducted. Most of the modelled emissions, which are associated with the planned full mining production after the granting of the Mining Right, do not yet contribute to background concentrations at the project site. Maximum predicted concentrations at nearby sensitive receptors (within 10km of the proposed mine boundary) are given in Table 5-14 and Table 5-15 for the construction and operational phases of the proposed mine, respectively. Predicted dustfall rates, PM2.5 & PM10 concentrations generally decrease as you move further away from the emission source. Thus, cumulative impacts for these pollutants will be higher nearer to the mine boundary.

**Table 5-20: Rating of Air Quality Impacts associated with mining activities at the proposed mine – Operational Phase.**

POTENTIAL ENVIRONMENTAL IMPACT	APPLICABLE AREA	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION										RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
			E	P	R	L	D	C	M	TOTAL	STATUS	SP		E	P	R	L	D	C	M	TOTAL	STATUS	SP
AREAS: 1. Within Mine Boundary																							
OPERATIONAL PHASE ACTIVITIES: 1. Mining Activities (blasting, drilling, bulldozing) 2. Material Handling Activities (excavators/FELs, Truck Loading/Offloading, material transfer points, etc.) 3. Hauling 4. Crushing & Screening 5. Stockpiles/exposed areas/pit.																							
<b>Air Quality: Operational Phase</b>																							
Dustfall -24H	1	1-5	2	4	3	2	4	4	4	76	-	M	Dust control plan for operational phase.	2	4	2	2	4	3	3	51	-	M
PM10 - 24H	1	1-5	2	4	3	2	4	4	4	76	-	M	Dust control plan for operational phase.	2	4	2	2	4	3	3	51	-	M
PM10 - annual	1	1-5	2	4	3	2	4	4	4	76	-	M	Dust control plan for operational phase.	2	4	2	2	4	3	3	51	-	M
PM2.5 - 24H	1	1-5	2	4	3	2	4	4	4	76	-	M	Dust control plan for operational phase.	2	4	2	2	4	3	3	51	-	M
PM2.5 annual	1	1-5	2	4	3	2	4	4	4	76	-	M	Dust control plan for operational phase.	2	4	2	2	4	3	3	51	-	M

Mitigation measures are included in the Environmental Management Programme (EMPr).

- **Ecology of ecology of watercourses**

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

The impact of the open cast mining during the operational phase will likely present habitat quality impacts to local riverine conditions. The alteration of the catchment area will result in altered hydrology, which will have an impact to local instream and riparian conditions, through shifts in the nature and volumes of flows. In addition, infiltration of groundwater into the open pits can be anticipated during this phase, this will have additional impacts on the hydrology of the associated watercourse. These effects are currently seen in the existing extent of the mining operations which developed through the watercourse. As is the case with open cast mines, as groundwater flows into the open pit, water will be required to be pumped to allow for the continuation of mining activities, it is therefore recommended that this water is utilised in the processing plant or in dust suppression activities. The use of access and haul roads are typically related to habitat modification, whereby runoff from the altered catchment modify the hydrology and sediment equilibrium of the downstream watercourse. In addition, direct hydrological impacts through reduced seepage as a result of the presence of an artificial surface can also be anticipated.

#### **7.4.2.1 Mitigation**

- *It is proposed that the southern tributary is diverted around active workings;*
- *It is proposed that the extent of the open pit within the 100m buffer is realigned;*
- *All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;*
- *Drilling equipment shall be equipped with a closed cabin to reduce noise and dust exposure.*
- *All riparian buffer zones must be avoided;*
- *The implementation of concurrent rehabilitation with roll-over mining methods;*
- *Alien vegetation removal in areas surrounding the open pit to be completed on a continuous basis;*
- *Effective stormwater management to divert water around the open pit areas;*
- *No discharge of contaminated water to occur via open pit dewatering;*
- *Appropriate Pollution Control Dams (PCD’s) should replace the current dirty water storage area in the current southern tributary;*
- *Open pit dewatering efforts should occur in the form of dust suppression on haul roads;*
- *The use of dust-suppression misting systems to mitigate dust emissions associated with the crushing and screening of mining ore;*
- *If conveyors are used on site, they must be covered in order to minimise the effects of wind;*
- *The use of appropriate stockpiles for overburden and waste rock must be implemented in designated areas;*
- *Implementation of sedimentation and erosion control in drainage surrounding the open cast areas;*
- *Consideration should be given to the use of erosion berms to prevent gully formation and siltation of the surrounding watercourses;*
- *While avoidances is the preferred course of action, if mining must commence in the whole extent of Portion 2, a WULA must be conducted for the diversion of the southern tributary, around the mining operations;*
- *A rehabilitation plan for the diverted southern tributary must be drafted for the Elandskraal Chromium Mine;*
- *A groundwater assessment must be conducted to understand patterns of subsurface flow and its interaction with local watercourses to better predict potential risks;*

- A floodline determination should be conducted for the proposed mining activities in order to determine the extent of the 1:100 year flood of the southern tributary. This is to mitigate the flooding of pits and required for all PCD design specifications;
- An annual adaptive water resource monitoring programme, whereby recommendations must be suitable implemented; and
- Bi-annual aquatic biomonitoring studies.

Table 19: DWS Risk Impact Matrix for the proposed project continued

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
<b>Operational Phase</b>								
Operation of open cast mine (blasting, pit formation, extraction, etc)	5	5	5	2	17	170	High*	High*
Use of access and haul roads	4	4	1	2	11	77	Moderate*	Low*
Use of large diesel equipment and vehicles	4	4	1	2	11	79.75	Moderate*	Low*
River diversion	5	5	5	2	17	157	High*	High*

Mitigation measures are included in the Environmental Management Programme (EMPr).

**Indirect impacts:** The operational phase will have an indirect negative impact through the change in the sense of place and an indirect positive impact through the provision of additional electrical infrastructure.

- Potential impact on tourism – the proposed mining right area is surrounding by mines and agricultural activities.

Potential impacts on tourism	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Possible (2)	Unlikely (1)
Duration	Long term (3)	Long term (3)
Magnitude	Low (1)	Low (1)
Reversibility	Partly reversible (2)	Completely reversible (1)
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	N/A	
<b>Significance</b>	<b>Negative low (7)</b>	<b>Negative low (6)</b>
Can impacts be mitigated?	No mitigation required	

### DECOMMISSIONING PHASE (MINE CLOSURE AND REHABILITATION)

**Direct impacts:** Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live. If infrastructures are removed after a 3/5 year period, the site will be returned to its natural state. Therefore, the physical environment will benefit from the closure of the mining area.

- Rehabilitation of the physical environment –

The following activities will take place at closure and during concurrent rehabilitation:

- As the opencast mining progresses, the voids created will be backfilled with overburden from the progressive opencast mining, and then overlain by the various soil horizons and rehabilitated;
- There will be a final void at the end of life of mine and this will be filled with overburden material;
- The area will be blended in with the surrounding landscape and allowed to be free draining;
- Once the void has been backfilled, 300mm thick topsoil or soft overburden in place of soil will be spread on rehabilitated areas; and
- Once placed, the “growth medium” should then be fertilised, ripped and re-vegetated. A small topsoil stockpile should be left for remedial work.

Rehabilitation of the physical environment	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Positive	Positive
Extent	Site (1)	Site (1)
Probability	Definite (4)	Definite (4)
Duration	Permanent (4)	Permanent (4)
Magnitude	High (3)	High (3)
Reversibility	N/A	N/A
Irreplaceable loss of resources	N/A	N/A
Cumulative impact	The impact would result in negligible to no cumulative effects (1)	
<b>Significance</b>	<b>Positive low (27)</b>	<b>Positive low (27)</b>
Can impacts be mitigated?	No mitigation measures required.	

- Loss of employment – According to the Mine Work Programme ±58 employees will be employed. Given the relatively large number of people employed during the operational phase, the decommissioning of the facility has the potential to have a negative social impact on the local community.

Loss of employment	Pre-mitigation impact rating	Post mitigation impact rating
Status (positive or negative)	Negative	Negative
Extent	Local (2)	Local (2)
Probability	Possible (2)	Possible (2)
Duration	Medium term (2)	Medium term (2)
Magnitude	Medium (2)	Medium (2)
Reversibility	Partly reversible (2)	Partly reversible (2)
Irreplaceable loss of resources	No loss of resource (1)	No loss of resource (1)
Cumulative impact	The impact would result in negligible to no cumulative effects (1)	
<b>Significance</b>	<b>Negative low (20)</b>	<b>Negative low (20)</b>
Can impacts be mitigated?	<p>The following mitigation measures are recommended:</p> <ul style="list-style-type: none"> <li>All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning.</li> <li><b>Bila Civil Contractors (Pty) Ltd</b> should establish an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas.</li> </ul>	

- Groundwater  
 During this phase it is assumed that active mining has stopped. No additional impacts on the groundwater of the study area are expected during the decommissioning phase of the project.



- Ecology of watercourses

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

#### **7.4.3 Decommissioning Phase**

*During the decommissioning activities the backfilling of the open pits will take place. Backfilling not only removes the voids in the landscape but prevents the oxidation of metals in the bare soil and surface which cause mine drainage. Limited disturbance to new areas can be anticipated during this time and therefore the impact of this phase is limited. All associated infrastructure to mining activities will also be removed.*

##### **7.4.3.1 Mitigation**

- Backfill all pits with overburden;
- The area must be contoured for a free draining landscape;
- The southern tributary must be rehabilitated to a natural channel allowing for flow;
- Erosion and sedimentation control must be in place within 1 month of completing the decommissioning phase for each pit;
- Establish a treatment facility for the water in the PCD's where the TDS and TSS can precipitate out and clean water discharged back into the watercourse;
- Complete avoidance of riparian buffer zones; and
- Alien vegetation removal in areas surrounding the open pit areas, completed on a continuous basis.

#### **7.4.4 Closure and Rehabilitation Phase**

*Once the pits have been backfilled with overburden and the landscape contoured the rehabilitation of the area must begin in order to bring the land back to a state as close to the ecological state before the mine was constructed, as possible. The largest component of this will be reintroducing topsoil and the revegetation of the landscape with indigenous species. The post closure concerns are the seepage from permanent waste stockpiles and acid mine drainage decant. If waste stockpiles are used for backfill open pits, it will eliminate this potential risk and add to the source of decant of acid mine drainage. The formation of the pits will have permanently altered subsurface flow with the established aquifers and aquicludes disturbed. This can form much larger storage areas for groundwater which permanently influences subsurface flows reducing baseflow.*

##### **7.4.4.1 Mitigation**

- Fertile topsoil must be brought into site for rehabilitation;
- Erosion and sedimentation control must be in place and an annual survey should be completed until at-least complete vegetation rehabilitation (as determined by an appropriate specialist);
- Alien invasive plant management plan must be in place; and
- Groundwater modelling of potential

Table 19: DWS Risk Impact Matrix for the proposed project continued

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
<b>Closure</b>								
Clearing of associated infrastructure	2	2	1	2	5	24.5	Low*	Low*
Rehabilitation of infrastructure footprint	2	2	1	1	6	27	Low*	Low*
<b>Post Closure</b>								
Mine drainage decant	4	4	5	3	16	160	Moderate*	Moderate*
Alterations to subsurface flow	4	4	5	4	17	161.5	Moderate*	Moderate*

(\* ) denotes - In accordance with General Notice 509 "Risk is determined after considering all listed control / mitigation measures. Borderline Low / Moderate risk scores can be manually adapted downwards up to a maximum of 25 points (from a score of 80) subject to listing of additional mitigation measures detailed below."



**Indirect impacts:** No indirect impacts are anticipated from the decommissioning phase of the proposed development.

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**K. SUMMARY OF THE FINDINGS AND RECOMMENDATIONS OF ANY SPECIALIST REPORT**

(where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;)

**Table 9:** Summary of The Findings and Recommendations of any Specialist Report

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Terrestrial Biodiversity Impact Assessment conducted by AGES	<p><b><u>Sensitivity analysis for the Remaining Extent of Portion 2, Portion 155 &amp; Portion 156 of the farm Elandskraal 469 JQ.</u></b></p> <p>The conservation status of the Marikana Thornveld vegetation unit (as described by Mucina &amp; Rutherford (2006) is Endangered. In spite of this, the project area is very disturbed and fragmented. The mining and the cultivated crops areas are disturbed to the extent that there is almost no natural vegetation remaining. The Thornveld areas are more natural, but still fragmented by mining, agriculture and township development, the sensitivity is therefore Medium to Low.</p> <p>The Vachellia nilotica – Vachellia tenuispina open thornveld is in a near-natural state. One species of conservation concern was recorded in this vegetation unit, namely Merwillia plumbea (Blue squill) which is Near Threatened. This vegetation unit therefore has a medium sensitivity. The wetland area has a high sensitivity, due to higher connectivity to other systems. See sensitivity map (Figure 10).</p>	X	

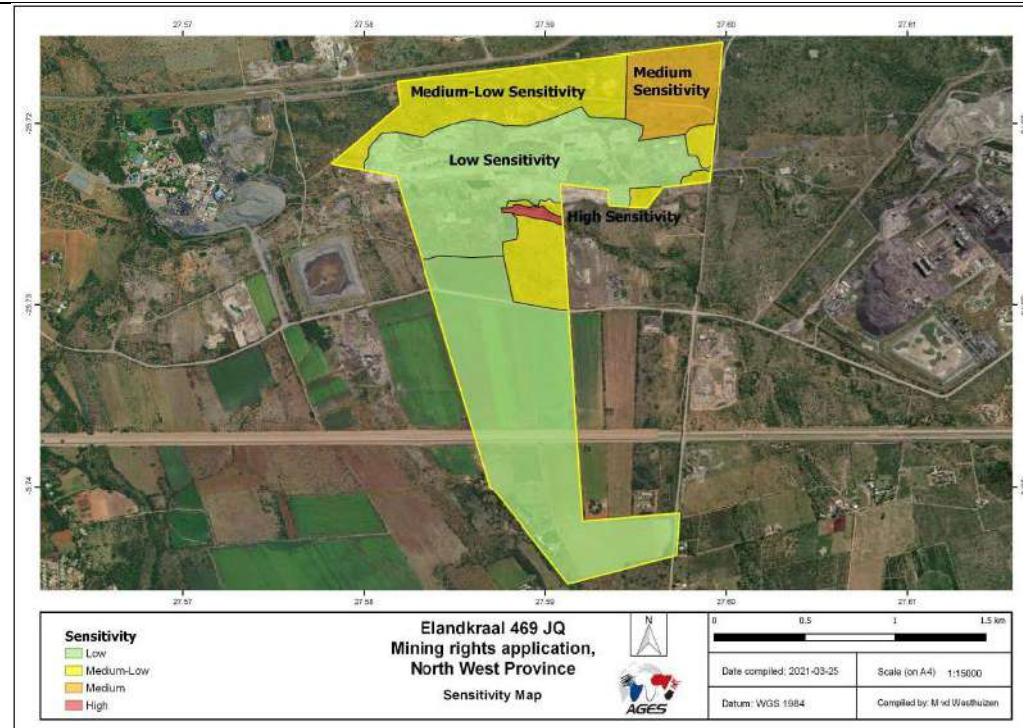


Figure 10: Sensitivity map

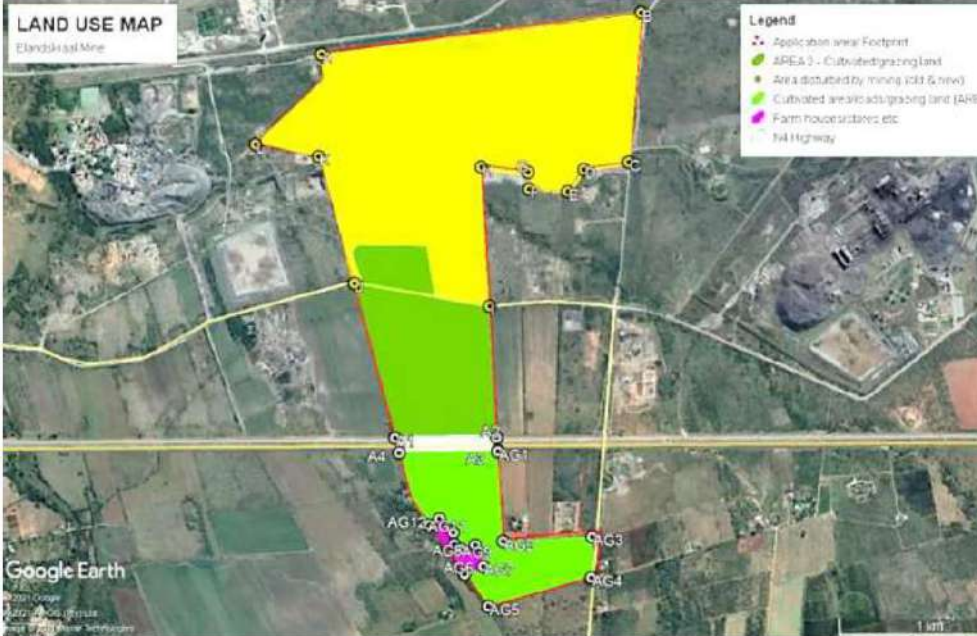
**CONCLUSIONS**

The desktop study indicated that the project area is located mainly in the Marikana Thornveld vegetation unit and a smaller part in the Moot Plains Bushveld, as described by Mucina and Rutherford (2006). The conservation status of these vegetation units are Endangered and Vulnerable, respectively. The project area falls into Critical Biodiversity Area 2, and Ecological Support Area 1 and 2. There is one National Freshwater Ecosystem Protected Areas (NFEPAs) in the project area, but this is an artificial wetland created by previous mining activities.

Seven vegetation units were identified and four described in detail. One species of conservation concern was recorded (Merwillia plumbea – Blue quill in the Near Threatened category). No protected trees were recorded.

The screening tool listed one vulnerable plant species and one vulnerable animal species. Non of these were recorded and it is unlikely that they will be present in the project area, as they are sensitive to

	<p>disturbance and the area is disturbed. The screening tool also lists one bird species namely Sagittarius serpentarius (secretary bird). The habitat is not ideal for Secretary birds, as they prefer open grassland or open savanna.</p> <p>A desktop survey was completed to determine which fauna species may occur in the project area according to its distribution and habitat requirements.</p> <p>Most of the project area has a low or low to medium sensitivity. One part has a medium sensitivity.</p>		
<p>Agricultural Compliance Statement (Site Sensitivity Verification) conducted by Celtis Environmental Solutions</p>	<ul style="list-style-type: none"> <li>• <i>the majority of the current land use of the land should be adjusted to reflect MINING ACTIVITIES (old and new) on a major disturbed area of 188 ha;</i></li> <li>• <i>the rest of the application area covers an surface area (area 1 &amp;2) that is used for AGRICULTURAL ACTIVITIES. The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural).</i></li> <li>• <i>Most of the original vegetation cover was replaced by cultivated fields (planted pastures) and fruit trees.</i></li> <li>• <i>The environmental sensitivity as identified by the screening tool should not be VERY HIGH , but LOW sensitivity for the MINING AREA and MEDIUM environmental sensitivity for the Area 1 &amp; 2 Agricultural area.</i></li> <li>• <i>Majority of the surface area is (incl. soil cover) disturbed by mining activities such as , opencast voids, waste rock dumps dumped on top of topsoil, gravel access roads, ore stockpiles , topsoil dumps, berms, rehabilitated waste rock dumps, etc. Vegetation cover totally disturbed by mining activities. Shallow soils and rock outcrops found in this area. During 2009 already a portion of the surface area has been regarded “ Degraded land”.</i></li> </ul>	<p><b>X</b></p>	

	 <p>Map from the specialist report</p>		
<p>Phase 1 Heritage Impact Assessment conducted by Palaeo Field Services</p>	<p><b>Field Assessment</b>  <i>Area 1 has been impacted by ongoing mining activities, as witnessed by multiple excavation, diggings and overgrown rubble heaps (Fig. 7). Areas 2 and 3 have been altered by ongoing farming activities (Fig. 8 &amp; 9). A foot survey and has indicated no evidence for Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no evidence of Iron Age structures, rock engravings or historical buildings older than 60 years within the study areas. A large cemetery is located near the northern boundary of Area 1 (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E; Fig.10 &amp; 11).</i></p> <p><b>Impact Statement</b>  <i>Palaeontologically insignificant Bushveld Complex granites that are capped by superficial (Quaternary) deposits considered to be of low palaeontological sensitivity underlie the study area. The study area is located within a region that is known for rock engraving sites and that bears rich archaeological as well as historical evidence of early migration, fission and subsequent development of early Sotho-Tswana people, leading to the establishment of numerous Iron Age settlements and complexes. However, the field assessment has indicated the there is no above-ground evidence of prehistoric structures, historical buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the</i></p>	<p>X</p>	

	<p>demarcated area (Table 1). The cemetery is rated Local Significance (Grade 3A). The rest of the development footprint is rated Generally Protected C (GP.C).</p> <p><b>Recommendations</b>          According to Section 36(3) of the National Heritage Resources Act 25 of 1999 no person may, without a permit issued by SAHRA or a provincial heritage resources authority—</p> <p>(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;          (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or          (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.</p> <p>It is recommended that the graveyard is included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a 20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities. It will be necessary to ensure that the graveyard is accessible to the relatives of the deceased.</p>		
<p>Geohydrological Investigations conducted by Afri GS 95 (Pty) Ltd</p>	<p><b>Conclusions</b>          This geohydrological report has been compiled as supporting documentation for the Water Use License Application being submitted in terms of Section 21(a) of the National Water Act (Act 36 of 1998) – for the taking of water from a water resource. In the case of the proposed project, water will be abstracted from two existing boreholes (Section 3.6.4) on the property for use in the mining operations and washing plants.</p> <p><b>Summary &amp; recommendations</b></p> <ul style="list-style-type: none"> <li>• This report provides the necessary information as required by the delegated authority, the Department of Water and Sanitation (DWS), in support of a Water Use licence application for Bila Chrome Mine.</li> <li>• Groundwater will be utilised in the chrome beneficiation process. Proposed groundwater abstraction is estimated at 85.71 m<sup>3</sup>/day.</li> <li>• Data from the Groundwater Resource Assessment Phase II (GRA II) study has been utilized in this study. GRA II is a model for estimation of groundwater allocation scenarios &amp; standardized groundwater parameters.</li> <li>• Bila Chrome Mine is located in Quaternary catchment A21K with average static water level = 15.81 m; an average weathered thickness of 23.65 m and average fractured aquifer thickness of 140.01 m; the calculated total aquifer thickness = 163.66 m.</li> <li>• Two boreholes were located within the project area and both were sampled for macro-chemical analysis. Water quality results suggest that groundwater at both boreholes is Class IV (Unacceptable quality) due to elevated Total hardness and magnesium.</li> </ul>	<p>X</p>	



	<ul style="list-style-type: none"> <li>• 24 Hour constant discharge tests have been conducted at two existing boreholes on the property &amp; pump test analysis has been done using the FC Method &amp; Cooper Jacob approximations.</li> <li>• Both boreholes are recommended for production processes at the Mine &amp; borehole equipping recommendations are as shown in Table 5.</li> <li>• The calculations for available water in aquifer storage indicate aquifer storage of 289 370.24 m<sup>3</sup></li> <li>• Sustainable aquifer yield calculations indicate an average sustainable yield on the property of 136.82 m<sup>3</sup>/day (i.e 1.58 l/sec).</li> <li>• It is recommended to install flow meters at each production borehole</li> <li>• The regional geology indicates to be of the Bushveld Complex. The Bushveld Complex is seated in the central northeast portion of the Kaapvaal craton and is regarded as having been emplaced in an intra-cratonic, anorogenic setting possibly related to mantle pluming.</li> <li>• The geology of the study area is dominated by pyroxenite, norite and anorthositic rocks of the Ruighoek Pyroxenite, Mathlagame Norite-Anorthosite and Eerlyk bronzite &amp; Kroondal norite formations which all occur within the Rustenburg Layered Suite (RLS).</li> <li>• At the study site two main aquifers can be distinguished which are the weathered zone aquifer and deep fractured (bedrock) aquifer.</li> <li>• Groundwater generally flows in a north north westerly (NNW) direction through the study area. Groundwater also appears to flow in the direction of the major drainage features within the project area.</li> <li>• Chrome mining &amp; processing activities generally have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range phosphate PO<sub>4</sub><sup>2-</sup> (mg/l), Sulphates PO<sub>4</sub><sup>2-</sup> (mg/l) and Chromium (total) Cr (mg/l).</li> <li>• It is thus recommended to drill at least two monitoring boreholes. One upstream and the other downstream of the study site.</li> <li>• The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa &amp; Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.</li> </ul>		
<p>Riverine Baseline Study conducted by the Biodiversity Company</p>	<p><b>Conclusion</b></p> <p><b>Baseline Environment</b></p> <p>The Maretswana River reach (A21K - 01028 SQR) associated with the Elandsdraal Chromium Mine extension is considered seriously modified (D) at desktop level (PES). Through the assessment conducted, this was corroborated by the calculated PES for the system (class D for the Maretswana River reach and class E for the southern tributary). In-situ water quality indicated natural levels in the Maretswana River when compared to DWAF guidelines which indicate water quality would not be a hinderance to aquatic life. This</p>	<p><b>X</b></p>	

	<p>requires further chemical analysis in ex-situ samples in order to investigate the concentrations of dissolved salts and metals associated with chromium mining as the macroinvertebrate assessment conflicted with natural water quality conditions. The March 2020 and June 2023 surveys indicated that habitat availability was varied throughout the assessed watercourses. The results of the SASS5 assessment classified the reach and associated tributary as largely to critically modified due to low presence of taxa comprised only of tolerant families during the 2020 survey. This points to physiochemical modification within the reach. The results of the June 2023 indicated the increase in the sampled macroinvertebrate communities in a downstream direction from M1 to M2. MIRAI indicated a class D/E (largely to seriously modified state) in March 2020 and C/D (moderately to largely modified) for the Maretswana River and class E or seriously modified state for the southern tributary, identifying water quality modification as the largest source of the absence of expected taxa. This improvement in the Maretswana River is likely due to improved habitat availability, water quality and flow diversity in 2023 as noted by the improved water quality driver response scores</p> <p>The available habitat within the Maretswana River reach was found to be largely modified in both the riparian and instream areas. The largest modifiers were to bed, flow and channel modification and degradation to water quality. The associated northern and southern tributaries were classed as having largely modified instream habitat and critical modified riparian habitat. The sources of modification the tributaries are the same as the Maretswana River reach, just more severe with the largest contributor the mines which have developed through the watercourse. Riparian areas are identified as sensitive areas within the endangered Marikana Thornveld vegetation type which has constituted a 100m buffer.</p> <p>A total of 15 fish species expected in the Maretswana River reach and associated tributaries with 8 species sampled which includes the vulnerable <i>O. mossambicus</i> and near threatened <i>Enteromius motebensis</i>. The catchment is a Fish Support Area for <i>E. motebensis</i> which was not sampled. As a whole the class of fish expected in the Maretswana River are moderately tolerant to changes in flow and tolerant to physico-chemical modification. The FRAI indicates a largely modified natural fish community structure within the reach.</p> <p><b>Impact Statement</b> An impact statement is required as per the NEMA regulations with regards to the proposed development.</p> <p>Based on desktop and survey findings in this report, the specialist agrees with the “Very high” aquatic theme sensitivity as per the National Web-based Environmental Screening Tool. This is attributed to:</p>		
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	<ul style="list-style-type: none"> <li>• The project footprint overlaps with the North West ESA 1 and ESA 2 aquatic areas and is in close proximity to, and drains into a CBA 1 and CBA 2 classified area (the Maretswana River).</li> <li>• The project area is within a Fish Support Area, classified FEPA river designated to the assessed watercourse and catchment area.</li> <li>• The project area is located along a 'Critically Endangered' and 'Not Protected' watercourse.</li> <li>• The project area is within the Priority Focus Areas and conservation area.</li> </ul> <p>The risk assessment conducted for the Elandsdraal chromium mine extension identified potential risks associated with the life of mine. The construction phase is considered a low risk, with the same said for decommissioning phase in which the infrastructure is removed, further mitigated by rehabilitation. The operational phase of the open cast mine has two low post mitigation risks and two high risks in the form of the operation of the mine and potential river diversion if utilized by the mine. The closure of the mine has two post mitigation moderate risks namely mine drainage decant and alteration to subsurface flow.</p> <p>The identified Moderate and High risks negate the possibility for a General Authorisation (GA) and assumes the need for a full Water Use Licence Application (WULA). These associated risks should also be considered for the Environmental Authorisation process. The Elandsdraal Chromium Mine Extension into Portion 2 has the potential to degrade local water resources. Insufficient detail pertaining to the proposed mine plan, alternatives as well as the layout of associated infrastructure was available. Furthermore, no information pertaining to groundwater interactions or hydrological interactions were available presenting significant gaps in this study.</p> <p>The proposed pit location intersects with a delineated riparian buffer zone and historical watercourse. It has therefore been recommended that a diversion of the watercourse take place and that closure activities rehabilitate the watercourse to its original channel.</p>		
<p>Air Quality Impact Assessment conducted by Rayten Engineering Solutions (Pty) Ltd</p>	<p><b>SUMMARY AND CONCLUSIONS</b></p> <p>Rayten Engineering Solutions (Pty) Ltd was appointed by Milnex Environmental Consultants to compile an Air Quality Impact Assessment (AQIA) report for the proposed operation of Bila Elandsdraal Mine (hereafter referred to as the "proposed mine"), located near Mooinooi, within the Madibeng Local and Bojanala District Municipalities, North-West Province. The project area falls within the Nationally Declared Waterberg-Bojanala Priority Area (WBPA).</p> <p>There is an existing Prospecting Right for the proposed mine, which was granted with accommodations for bulk sampling. As such, prospecting activities already deployed as a result of the bulk sampling exercise</p>	<p>X</p>	

	<p>have resulted in the trial mining of the mineral resources discovered and the testing of the mineral product into the market. Current surface operations at the proposed mine are therefore at trial mining stage, with the intention of ramping into full mining production to 50 000 tonnes of chrome Run of Mine (ROM) per month, immediately after the granting of the Mining Right by the Department of Mineral Resources and Energy. Part of the infrastructure required for the proposed mine has already been developed/constructed as part of the work undertaken during the bulk sampling activities and trial mining.</p> <p>As part of the combined Mining Right and Waste Management License application for the proposed mine, an environmental impact assessment (EIA) process, which includes the Scoping and EIR phase, must be undertaken. This AQIA has been compiled as a supporting document for the EIA process. The main objective of the AQIA is to determine the potential impact of emissions associated with surface operational activities at the proposed mine (at full production) on ambient air quality in terms of dustfall (as Total Suspended Particulates (TSP)) and criteria air pollutants.</p> <p>As part of the AQIA, a baseline air quality assessment was undertaken to determine the following:</p> <ul style="list-style-type: none"> <li>• the prevailing meteorological conditions at the site;</li> <li>• establish baseline concentrations of key air pollutants of concern;</li> <li>• identify existing sources of emissions; and</li> <li>• identify key sensitive receptors surrounding the project site.</li> </ul> <p>The main conclusions for the Baseline Assessment are as follows:</p> <p>The proposed mine is located in Mooinooi on Portions 2, 155 and 156 of the farm Elandsdraal 469, Registration Division: JQ, North-West Province. The project area falls within the Nationally Declared Waterberg-Bojanala Air Quality Priority Area. The land use immediately surrounding the proposed mine consists mostly of cultivated land, grassland and forested land, with few areas consisting of built-up sections, residential areas, shrubland, mines and quarries, wetlands and waterbodies. The larger area surrounding the proposed mine is classified as rural in nature. Existing key sources of airborne emissions surrounding the project site have been identified as follows:</p> <ul style="list-style-type: none"> <li>• Agricultural activity (temporary and permanent crops) and potential biomass burning (surrounding areas);</li> <li>• Planted forest (mostly in the south-eastern quadrant);</li> <li>• Extraction sites (mainly west, north, and north-east of the proposed mine);</li> <li>• Vehicle dust entrainment on unpaved roads (surrounding areas); and</li> <li>• Waste and resource dumps (mostly west, north-west and east of the proposed mine).</li> </ul> <p>MM5 meteorological data for the project area for the period 01 January 2020 – 31 December 2022 was used for input into the dispersion model and to determine prevailing meteorological conditions for the project site.</p>		
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	<p>Based on the prevailing wind fields for the period January 2020 to December 2022, emissions from activities at the proposed mine will likely be transported towards the north-westerly wind direction, as evident in the dispersion model output plots in Sections 5.3.1 and 5.3.2. Moderate to fast wind speeds observed during all the time periods, may result in effective dispersion and dilution of emissions from the proposed mine operations; however, higher winds speeds can also facilitate fugitive dust emissions from open exposed areas such as stockpiles and opencast areas. Removal of particulates via wet depositional processes would be evident during the warmer (wet) seasons (spring – early autumn) thus lower ambient concentrations of dust could be expected during these seasons. Over the remainder of the year higher ambient concentrations of particulates could be expected.</p> <p>The existing air quality situation was evaluated using available monitoring data for PM10 and PM2.5 from a permanent ambient air quality monitoring station (AQMS) operated near the project site, i.e. at the Marikana AQMS (-25.698444°S; 27.480111°E), which is located approximately 10.25km west-northwest of the proposed mine. The ambient air quality monitoring data covers the period 01 January 2020 – 31 December 2022. The data capture rate at the Marikana AQMS was above average for PM10 and PM2.5, i.e. PM10 (70%) and PM2.5 (70%). Several exceedances, i.e. 384 and 94 exceedances of the PM10 and PM2.5 daily standards of 75 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup>, respectively, were recorded over the monitoring period. Furthermore, PM10 concentrations exceeded the annual standard of 40 µg/m<sup>3</sup> in 2020, 2021 and 2022, while PM2.5 concentrations exceeded the annual standard of 20 µg/m<sup>3</sup> in 2021 and 2022.</p> <p>In terms of the South African National Ambient Air Quality Standards (NAAQS), 4 exceedances of the PM10 24-hour standard are permitted within a calendar year, while no exceedances of the PM10 annual standard are permitted. Additionally, no exceedances of the PM2.5 24-hour and annual standards are permitted within a calendar year. Thus, background PM10 and PM2.5 concentrations at the project site are non-compliant with the South African NAAQS. Baseline dustfall data could not be provided in this AQIA report as there are no available dustfall networks operated near the project site, that could be determined.</p> <p>The main conclusions of the AQIA for the proposed project can be summarised as follows:</p> <p>Dustfall, PM10 and PM2.5 are key pollutants of concern associated with the opencast mining operations at the proposed mine and will be emitted from the following key sources:</p> <p><b>Dust and Particulate Emissions:</b></p> <ul style="list-style-type: none"> <li>• Construction activities (limited to development/expansion of infrastructure to cater for the planned full capacity of operation);</li> <li>• Drilling and blasting at the opencast pit (to break overburden and Run-of-Mine (ROM));</li> <li>• Bulldozing (moving material and shaping stockpiles);</li> <li>• Material handling operations (truck loading/offloading operations);</li> <li>• Conveyor transfer points;</li> </ul>		
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	<ul style="list-style-type: none"> <li>• Transportation/hauling of ROM (trucks);</li> <li>• Material storage: Stockpiling;</li> <li>• Crushing and screening;</li> <li>• Excavators and front-end loaders (stripping ore and overburden and loading trucks);</li> <li>• Wind erosion from exposed areas (i.e. exposed surfaces, and material stockpile areas); and</li> <li>• Vehicle dust entrainment on unpaved roads.</li> </ul> <p>Based on the dispersion model output plots for the construction phase, predicted incremental dustfall rates and PM (PM10 and PM2.5) concentrations are relatively low and mostly in compliance with the applicable standards over the project area modelled (i.e. the area within the 20m x 20m modelling domain). Higher concentrations, including exceedances of the residential and non-residential area standards of 600 mg/m<sup>2</sup>/day and 1 200 mg/m<sup>2</sup>/day for dustfall, as well as the daily and annual standards of 75 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup> for PM10, respectively, are projected over small areas inside the facility boundary, as well as along a small section of the south-eastern boundary for PM10. For PM2.5, no exceedances of the daily and annual PM2.5 standards of 40 µg/m<sup>3</sup> and 20 µg/m<sup>3</sup>, respectively, are projected.</p> <p>For the operational phase, predicted incremental dustfall rates and PM concentrations are high but mostly in compliance with applicable standards over the project area. For dustfall and annual PM2.5, higher concentrations, including exceedances of the residential and non-residential area standards (for dustfall) and the annual NAAQS (for PM2.5) are projected near the proposed surface mining activities and beyond the proposed mine boundary to the south-west, north-west and south-east, within a 360m radius. Dispersion patterns in predicted annual PM10 and daily PM2.5 concentrations are also similar, with predicted concentrations falling below the applicable NAAQS over most areas surrounding the proposed mine, except at areas north-west and north-east of the proposed mine, where exceedances of the NAAQS are projected up to 930m and 1.4km from the mine boundary for annual PM10 and daily PM2.5, respectively. Predicted daily PM10 concentrations are projected to exceed the applicable limit at all offsite locations surrounding the mine, especially north-west and north-east of the boundary where the exceedances extend up to a maximum radius of 5.3km from the boundary.</p> <p>Based on predicted PM concentrations for the operational phase, which are high and well above applicable limits, the proposed mine is likely to be a significant source of incremental PM10 and PM2.5 concentrations in the area during the operational phase. Since background PM10 and PM2.5 concentrations at the project site are already high, with several exceedances of the daily and annual PM10 and PM2.5 NAAQS recorded over the January 2020 – December 2022 monitoring period at the Marikana AQMS, as seen in Sections 4.2.1 and 4.2.2, the proposed activities will likely result in high cumulative impacts. The proposed mine is also anticipated to be a significant source of incremental dustfall rates during the operational phase due to the high dustfall rates projected from the dispersion modelling exercise. During the construction phase, for which relatively low incremental concentrations are predicted, the proposed mine is not expected to be a</p>		
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	<p>significant source of incremental PM10 and PM2.5 concentrations in the area, thus lower cumulative impacts would be expected.</p> <p>Maximum predicted incremental dustfall rates and PM concentrations at all nearby sensitive receptors located within 10km from the proposed mine boundary fall well below the applicable limits for the construction phase. For the operational phase, low predicted incremental dustfall rates and PM concentrations are observed at most of the discrete receptors, except at DR26 (Machadam Combined School), DR27 (Elandsdrift dwellings) and DR28 (Mooinoi Bokamoso dwellings), which are all downwind of the proposed mining operations, where exceedances of the daily PM10 standard are predicted. Receptors DR26 – DR28 could be at risk since they are potentially already exposed to background emissions released from other nearby mining activities and waste and resource dumps in surrounding areas. Thus, it is recommended that the proposed mine manage and mitigate dustfall emissions associated with proposed surface mining activities as far as possible to minimise the impact on these receptors.</p> <p>Mitigation measures that were considered in this modelling study were limited and included dust suppression using water sprays on all the unpaved haul routes (i.e. route from pit area to ROM stockpile), and moisture content of product material. As dust is the key pollutant of concern associated with activities at the proposed mine, dust suppression should be conducted where possible, to reduce additional levels in background concentrations at the site. In addition, it is recommended that an internal dust management plan be compiled and implemented during the operational phase of the proposed mine. Dustfall monitoring is also recommended prior to commencement of full operations at the mine to determine baseline dustfall rates. The monitoring should be continued during the operational phase.</p> <p>In conclusion the dispersion modelling results indicate relatively low predicted dustfall rates and PM concentrations for the construction phase, with offsite exceedances of applicable standards projected for dustfall and PM10 only. However, the exceedances are restricted to a small section along the south-eastern boundary. For the operational phase, while higher predicted dustfall rates and PM concentrations are predicted, they remain below applicable limits over most of project area. Exceedances projected beyond the proposed mine boundary are more pronounced for daily PM10 concentrations, for which exceedances are predicted over a wider area in surrounding areas, especially towards the north-west and north-east - within a maximum radius of 5.3km. For dustfall and annual PM2.5, non-compliances with applicable limits projected outside the mine boundary are restricted to areas south-west, north-west and south-east of the proposed mine, within a 360m radius; for annual PM10 and daily PM2.5, exceedances at offsite locations are restricted to areas north-west and north-east of the boundary, within maximum radii of 930m and 1.4km, respectively.</p> <p>Based on the above information, Rayten believes the commencement of full mining operations at the proposed Bila Elandskraal mine can go ahead if the dust mitigation measures recommended in this AQIAr are strictly implemented as much as possible, where feasible, in order to reduce dust emissions at the proposed mine. Emissions associated with the proposed mine are predicted to have a low to medium</p>		
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	<p>negative impact on air quality if mitigation measures are implemented, with no fatal flaws identified after the implementation of mitigation measures</p>		
<p>Blast Impact study conducted by Blast Management &amp; Consulting</p>	<p><b>25 Conclusion</b>                  Blast Management &amp; Consulting (BMC) was contracted as part of Environmental Impact Assessment (EIA) to perform an initial review of possible impacts with regards to blasting operations in the proposed opencast mining operation.</p> <p>Ground vibration, air blast, fly rock and fumes are some of the aspects as a result from blasting operations. The report evaluates the effects of ground vibration, air blast and fly rock and intends to provide information, calculations, predictions, possible influences and mitigations of blasting operations for this project.</p> <p>The evaluation of effects yielded by blasting operations was evaluated over an area as wide as 3500 m from the mining area considered. The range of structures observed is typical roads (tar and gravel), low-cost houses, corrugated iron structures, industrial buildings, brick and mortar houses, power lines/pylons.</p> <p>The location of structures around the Pit area is such that the charge evaluated showed possible influences due to ground vibration. The closest structures observed are the Road, Mine Buildings/Structures, Hydrocencus, Dam and Power Lines/Pylons. The ground vibration levels predicted for these POI's ranged between 0.4 mm/s and 788.0 mm/s for structures surrounding the open pit areas. The expected levels of ground vibration exceed limits for seven specific structures (POI's 2, 3, 5, 9, 16, 17 and 190) and will require specific mitigations in the way of adjusting charge mass per delay to reduce the levels of ground vibration. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage.</p> <p>Air blast predicted showed greater concerns for opencast blasting. The current accepted limit on air blast is 134 dBL. Damages are only expected to occur at levels greater than 134dB. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pits are located such that "free blasting" – meaning no controls on blast preparation – will not be possible.</p> <p>Prediction shows that air blast will be greater than 134 dB at distance of 390 m and closer to pit boundary. Infrastructure at the pit areas such as roads and power lines/pylons, are present, but air blast does not have any influence on these installations.</p> <p>Fly rock remains a concern for blasting operations. Based on the drilling and blasting parameters values for a possible fly rock range with a safety factor of 2 was calculated to be 493 m. The absolute minimum unsafe zone is then the 493 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded. Best practices should be implemented at all times. The occurrence of fly rock can be mitigated but the possibility of the occurrence thereof can never be eliminated.</p>	<p>X</p>	



	<p>Specific actions will be required for the pit area such as Mine Health and Safety Act requirements when blasting is done within 500 m from structures and mining with 100 m for structures. The Mine Buildings/Structures, Dam, Road, Power Lines/Pylons and Hydrocencus falls within the 500 m range from the pit area.</p> <p>The pit area is located such that specific concerns were identified and addressed in the report. There are public structures located very close to the pit boundary. Specific mitigation will be required for these concerns. Recommendation have been made regarding these.</p> <p>A minimum of 50 m boundary must be maintained between the surface blasting and the underground blasting operations and a maximum of 620 kg can be allowed safely. At 56 m 620 kg is expected to yield 150 mm/s. However it is recommended that single hole firing is maintained when blasting next to the underground workings.</p> <p>This concludes this investigation for the proposed Elandskraal Chrome Mine Project. There is no reason to believe that this operation cannot continue if attention is given to the recommendations made.</p>		
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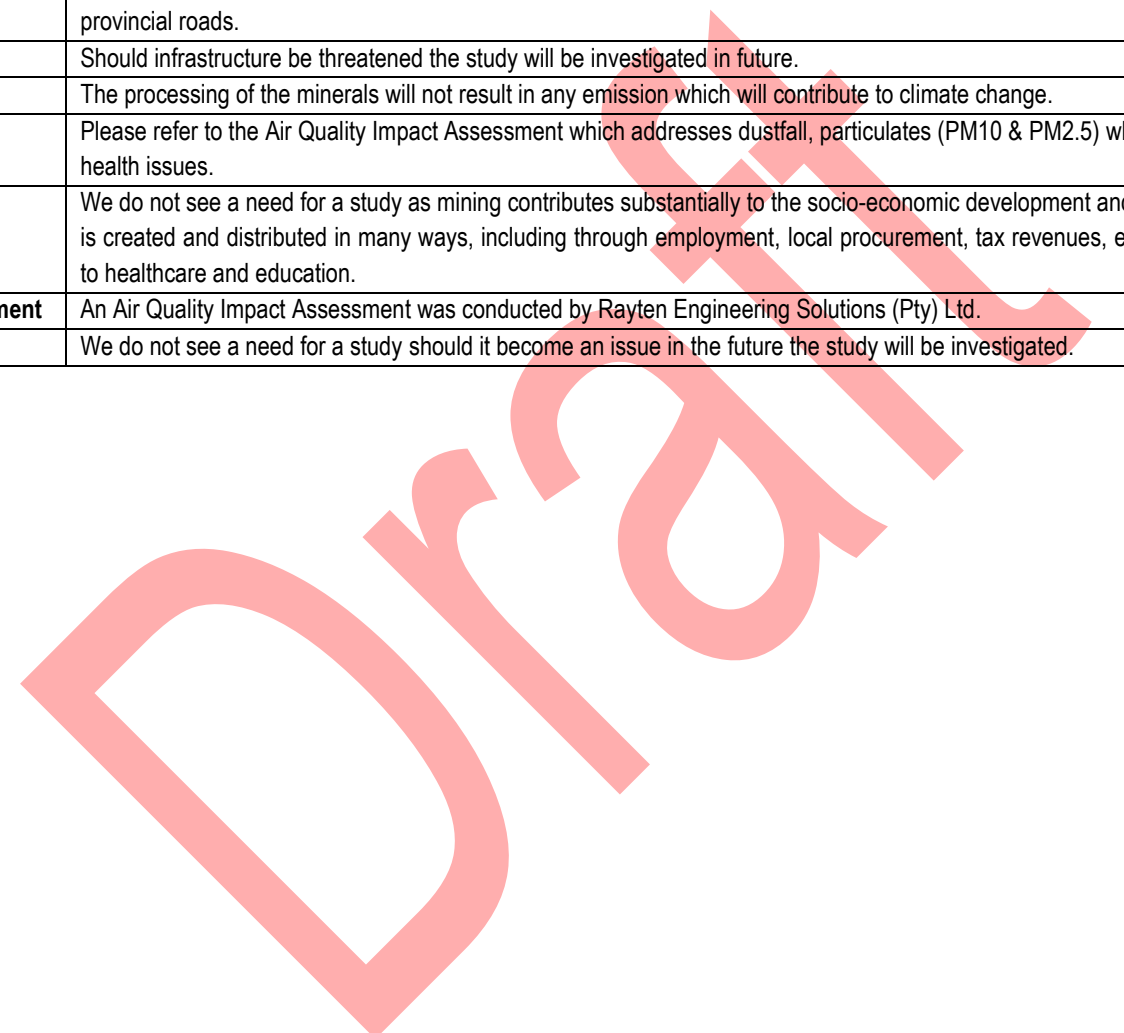
Please refer to **Appendix 11** for the specialist reports

According to the DFFE Screening Report, specialist assessments have been identified for inclusion in the assessment report. Please see the table below for the list of these studies and also our response. Please refer to **Appendix 7**.

Specialist study according to DEA Screening tool		Response
<b>Agriculture Impact Assessment</b>		Agricultural Compliance Statement (Site Sensitivity Verification) conducted by Celtis Environmental Solutions.
<b>Landscape/Visual Impact Assessment</b>		We do not see a need for this study as there are currently prospecting activities occurring on the proposed area. The proposed mining right area is also surrounded by mines to the North, East and West side.
<b>Archaeological and Cultural Heritage Impact Assessment</b>		A Phase 1 Heritage Impact Assessment was conducted by Palaeo Field Services.
<b>Palaeontology Impact Assessment</b>		
<b>Biodiversity study</b>	<b>Animal Species Assessment</b>	A Terrestrial Biodiversity Impact Assessment and a Riverine Baseline Study was done.

	<b>Aquatic Biodiversity Impact Assessment</b>																								
	<b>Plant Species Assessment</b>																								
	<b>Terrestrial Biodiversity Impact Assessment</b>																								
<b>Hydrology Assessment</b>	Hydrological calculations were done for the Water use Licence application and a Stormwater management plan compiled. Geohydrological study was conducted which includes Hydrocensus data within a 2 km radius of the site																								
<b>Noise Impact Assessment</b>	<p>We do not see a need for such a study as there are other mines in the surrounding area and noise mitigation measures are included in the Environmental Management Programme (EMPr). The follow should however be considered:</p> <p>Industrial / Commercial noise impacts should not exceed the levels presented in Table below of South African Standards or result in a maximum increase above background levels of 3 dBA at the nearest receptor location off-site.</p> <p>The noise levels are relevant to noise impacts beyond the property boundary of the facility. However, noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. A point of reception or receptor may be defined as any point on the premises occupied by persons where extraneous noise and/or vibration are received.</p> <p>South African National Standard (SANS) 10103 (2008) provides a guideline for estimating community response to an increase in the general ambient noise level caused by intruding noise.</p> <table border="1"> <thead> <tr> <th rowspan="3">SITE</th> <th colspan="2">WHO / IFC</th> <th colspan="2">SOUTH AFRICAN STANDARDS</th> </tr> <tr> <th colspan="2">LAEQ (1H) DBA</th> <th colspan="2"></th> </tr> <tr> <th>DAY 07:00 – 19:00</th> <th>NIGHT 19:00 – 07:00</th> <th>DAY 07:00 – 19:00</th> <th>NIGHT 19:00 – 07:00</th> </tr> </thead> <tbody> <tr> <td>Residential; Institutional; Educational</td> <td>55</td> <td>45</td> <td>55</td> <td>45</td> </tr> <tr> <td>Industrial, Commercial</td> <td>70</td> <td>70</td> <td>70</td> <td>60</td> </tr> </tbody> </table> <p>The possible noise and increased ground vibration during blasting and mine activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles, compliance to the Local Noise Regulations, and the International Finance Corporation's Environmental Health and Safety Guidelines.</p>		SITE	WHO / IFC		SOUTH AFRICAN STANDARDS		LAEQ (1H) DBA				DAY 07:00 – 19:00	NIGHT 19:00 – 07:00	DAY 07:00 – 19:00	NIGHT 19:00 – 07:00	Residential; Institutional; Educational	55	45	55	45	Industrial, Commercial	70	70	70	60
SITE	WHO / IFC			SOUTH AFRICAN STANDARDS																					
	LAEQ (1H) DBA																								
	DAY 07:00 – 19:00	NIGHT 19:00 – 07:00	DAY 07:00 – 19:00	NIGHT 19:00 – 07:00																					
Residential; Institutional; Educational	55	45	55	45																					
Industrial, Commercial	70	70	70	60																					

<b>Radioactivity Impact Assessment</b>	We do not see a need for the study since the process of mining the various minerals does not have any radioactive effects.
<b>Traffic Impact Assessment</b>	We do not see a need for this study as the majority of the material to be hauled will occur within the prosed site without having to use national or provincial roads.
<b>Geotechnical Assessment</b>	Should infrastructure be threatened the study will be investigated in future.
<b>Climate Impact Assessment</b>	The processing of the minerals will not result in any emission which will contribute to climate change.
<b>Health Impact Assessment</b>	Please refer to the Air Quality Impact Assessment which addresses dustfall, particulates (PM10 & PM2.5) which my possibly contribute to human health issues.
<b>Socio-Economic Assessment</b>	We do not see a need for a study as mining contributes substantially to the socio-economic development and wellbeing of its host communities. Value is created and distributed in many ways, including through employment, local procurement, tax revenues, enhanced infrastructure and better access to healthcare and education.
<b>Ambient Air Quality Impact Assessment</b>	An Air Quality Impact Assessment was conducted by Rayten Engineering Solutions (Pty) Ltd.
<b>Seismicity Assessment</b>	We do not see a need for a study should it become an issue in the future the study will be investigated.



## L. AN ENVIRONMENTAL IMPACT STATEMENT WHICH CONTAINS—

### (i) a summary of the key findings of the environmental impact assessment:

This section provides a summary of the assessment and conclusions drawn from the proposed mining area. In doing so, it draws on the information gathered as part of the environmental impact assessment process and the knowledge gained by the environmental consultant during the course of the process and presents an informed opinion on the environmental impacts associated with the proposed project. The following conclusions can be drawn for the proposed mining activity:

#### ➤ Potential impacts on biodiversity:

A Terrestrial Biodiversity Impact Assessment was conducted by AGES, the report is available under **Appendix 11**. Please see the findings below:

##### **Conclusion**

*The desktop study indicated that the project area is located mainly in the Marikana Thornveld vegetation unit and a smaller part in the Moot Plains Bushveld, as described by Mucina and Rutherford (2006). The conservation status of these vegetation units are Endangered and Vulnerable, respectively. The project area falls into Critical Biodiversity Area 2, and Ecological Support Area 1 and 2. There is one National Freshwater Ecosystem Protected Areas (NFEPA) in the project area, but this is an artificial wetland created by previous mining activities.*

*Seven vegetation units were identified and four described in detail. One species of conservation concern was recorded (Merwillia plumbea – Blue quill in the Near Threatened category). No protected trees were recorded.*

*The screening tool listed one vulnerable plant species and one vulnerable animal species. Non of these were recorded and it is unlikely that they will be present in the project area, as they are sensitive to disturbance and the area is disturbed. The screening tool also lists one bird species namely Sagittarius serpentarius (secretary bird). The habitat is not ideal for Secretary birds, as they prefer open grassland or open savanna.*

*A desktop survey was completed to determine which fauna species may occur in the project area according to its distribution and habitat requirements. Most of the project area has a low or low to medium sensitivity. One part has a medium sensitivity.*

## **5. DESCRIPTION AND ASSESSMENT OF ECOLOGICAL IMPACTS**

### **5.1.1 List of impacts**

- **Removal of indigenous vegetation**

*If mining activities expand into natural vegetation, indigenous vegetation will be removed. Loss of plant communities and flora species of significance may be caused due to the opencast mining activities, increased laydown area of the overburden and topsoil facilities, that used to represent natural vegetation communities. Rehabilitation of some areas would be possible but there is likely to be long-term disturbance in large areas.*

- **Habitat destruction**

*The clearance of vegetation will destroy the habitat of some species and may fragment other habitats.*

- **Spread of alien and invader species**

*Continued movement of personnel and vehicles on and off the site during the mining phase, will result in a risk of importation of alien species. Vehicles often transport many seeds and some may be of invader species, which may become established along the road, especially where the area is disturbed. The high levels of habitat disturbance also provide the greatest opportunities for invader species to establish themselves, since most indigenous species are less tolerant of disturbance. The spread of alien invasive plants on site is more INTENSE during the operational phase of the mine due to the movement of vehicles over an extended area on and from the site, causing a higher risk of potentially spreading the seeds or vegetative material from invasive species. Although construction creates the suitable conditions for establishment of invasive species, the operational phase certainly carries by far the greatest risk of alien invasive species being spread through the area. This risk is further influenced by increased run-off as a result of exposed areas and hardened surfaces created during the construction phase of the mine.*

- **Disturbance of fauna and fauna fatalities**

*Disturbance of remnant terrestrial wild mammal, avian, amphibian and insect fauna would probably occur through physical habitat destruction, noise, traffic and movement of people. The impact of the mining would be MODERATE to LOW considering that the area in general is already in a degraded state due to the surrounding mining activities and local communities. Therefore, animals would move away from the area, while some ground-burrowing species such as moles and reptiles might be killed in the process. Furthermore, opencast developments can threaten migration routes or flight paths as a result of noise and dust pollution. Cumulative impacts of illegal collecting, road kills or power line related deaths reduce population viability in the long-term. Some mining related habitats also favour species leading to un-natural competition with endemic fauna.*

- **Soil erosion and sedimentation**

*Vegetation prevents soil erosion. Once it is removed, soil erosion can occur. The increased hardened surfaces around infrastructure and exposed areas created alongside the open pit, as well as the roads and additional surface areas created on the slopes of the stockpiles and overburden facility will have a definite impact on the potential erosion of exposed areas*

- **Pollution**

*Exposure of rocks, ore and soils to rainfall and wind may lead to atmospheric contamination from dust and increased erosion of the site and sedimentation of local water courses. An increase in the movement of construction vehicles will result in an increase in the dust levels in the area. The environmental impacts of wind-borne dust, gases and particulates from the mining activities will have an impact on the vegetation of the area when dust settles on plant material reducing the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity and growth.*

*Heavy machinery and vehicles as well as sewage and domestic waste would be the main contributors to potential pollution problems relating to soil and water pollution on the project site.*

### 5.1.3 Impact assessment

*The impact assessment is given in Table 19 Impacts are assessed with mitigation (WM) and without mitigation (WOM).*

**Table 19: Impact assessment**

Impact	Type	Probability	Duration	Scale	Magnitude / Severity	Significance WOM	Significance WM
Removal of indigenous vegetation	Negative	Definite (WOM) (5) Definite (WM) (5)	Long term (WM) (4) Long term (WM) (4)	Local (WOM) (1) Local (WM) (1)	High (WOM) (8) Medium (WM) (6)	High (65)	Moderate (55)
Habitat destruction	Negative	Definite (WOM) (5) Definite (WM) (5)	Medium Term (WOM)(3) Medium Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	High (WOM) (8) Medium (WM) (6)	Moderate (60)	Moderate (50)
Spread of alien and invader plant species	Negative	Probable (WOM) (2) Probable (WM) (2)	Permanent (WOM) (5) Short Term (WM) (1)	Local (WOM) (1) Local (WM) (1)	Low (WOM) (2) Low (WM) (2)	Negligible (16)	Negligible (8)
Disturbance of fauna and fauna fatalities	Negative	Highly probable (WOM) (4) Highly probable (WM) (4)	Long Term (WOM)(4) Medium Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (44)	Low (24)
Soil erosion	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Local (WOM) (1) Local (WM) (1)	Medium (WOM) (6) Low (WM) (2)	Moderate (55)	Negligible (12)
Pollution	Negative	Definite (WOM) (5) Highly probable (WM) (4)	Long Term (WOM)(4) Short Term (WM) (3)	Regional (WOM) (3) Site (WM) (2)	Medium (WOM) (6) Low (WM) (2)	High (65)	Low (28)

The mitigation measures are included in the EMP.

### ➤ Potential impacts on watercourses

A Riverine Baseline Study was conducted by the Biodiversity Company, the report is available under **Appendix 11**. Please see the findings below:

#### Baseline Environment

*The Maretswana River reach (A21K - 01028 SQR) associated with the Elandskraal Chromium Mine extension is considered seriously modified (D) at desktop level (PES). Through the assessment conducted, this was corroborated by the calculated PES for the system (class D for the Maretswana River reach and class E for the southern tributary). In-situ water quality indicated natural levels in the Maretswana River when compared to DWAF guidelines which indicate water quality would not be a hindrance to aquatic life. This requires further chemical analysis in ex-situ samples in order to investigate the concentrations of dissolved salts and metals associated with chromium mining as the macroinvertebrate assessment conflicted with natural water quality*

conditions. The March 2020 and June 2023 surveys indicated that habitat availability was varied throughout the assessed watercourses. The results of the SASS5 assessment classified the reach and associated tributary as largely to critically modified due to low presence of taxa comprised only of tolerant families during the 2020 survey. This points to physiochemical modification within the reach. The results of the June 2023 indicated the increase in the sampled macroinvertebrate communities in a downstream direction from M1 to M2. MIRAI indicated a class D/E (largely to seriously modified state) in March 2020 and C/D (moderately to largely modified) for the Maretswana River and class E or seriously modified state for the southern tributary, identifying water quality modification as the largest source of the absence of expected taxa. This improvement in the Maretswana River is likely due to improved habitat availability, water quality and flow diversity in 2023 as noted by the improved water quality driver response scores

The available habitat within the Maretswana River reach was found to be largely modified in both the riparian and instream areas. The largest modifiers were to bed, flow and channel modification and degradation to water quality. The associated northern and southern tributaries were classed as having largely modified instream habitat and critical modified riparian habitat. The sources of modification the tributaries are the same as the Maretswana River reach, just more severe with the largest contributor the mines which have developed through the watercourse. Riparian areas are identified as sensitive areas within the endangered Marikana Thornveld vegetation type which has constituted a 100m buffer.

A total of 15 fish species expected in the Maretswana River reach and associated tributaries with 8 species sampled which includes the vulnerable *O. mossambicus* and near threatened *Enteromius motebensis*. The catchment is a Fish Support Area for *E. motebensis* which was not sampled. As a whole the class of fish expected in the Maretswana River are moderately tolerant to changes in flow and tolerant to physico-chemical modification. The FRAI indicates a largely modified natural fish community structure within the reach.

#### **Impact Statement**

An impact statement is required as per the NEMA regulations with regards to the proposed development.

Based on desktop and survey findings in this report, the specialist agrees with the “Very high” aquatic theme sensitivity as per the National Web-based Environmental Screening Tool. This is attributed to:

- The project footprint overlaps with the North West ESA 1 and ESA 2 aquatic areas and is in close proximity to, and drains into a CBA 1 and CBA 2 classified area (the Maretswana River).
- The project area is within a Fish Support Area, classified FEPA river designated to the assessed watercourse and catchment area.
- The project area is located along a ‘Critically Endangered’ and ‘Not Protected’ watercourse.
- The project area is within the Priority Focus Areas and conservation area.

The risk assessment conducted for the Elandskraal chromium mine extension identified potential risks associated with the life of mine. The construction phase is considered a low risk, with the same said for decommissioning phase in which the infrastructure is removed, further mitigated by rehabilitation. The operational phase of the open cast mine has two low post mitigation risks and two high risks in the form of the operation of the mine and potential river diversion if utilized by the mine. The closure of the mine has two post mitigation moderate risks namely mine drainage decant and alteration to subsurface flow.

The identified Moderate and High risks negate the possibility for a General Authorisation (GA) and assumes the need for a full Water Use Licence Application (WULA). These associated risks should also be considered for the Environmental Authorisation process. The Elandskraal Chromium Mine Extension into Portion 2 has the potential to degrade local water resources. Insufficient detail pertaining to the proposed mine plan, alternatives as well as the layout of associated infrastructure was available. Furthermore, no information pertaining to groundwater interactions or hydrological interactions were available presenting significant gaps in this study.

The proposed pit location intersects with a delineated riparian buffer zone and historical watercourse. It has therefore been recommended that a diversion of the watercourse take place and that closure activities rehabilitate the watercourse to its original channel.

➤ **Potential impact on heritage and Palaeontological resources:**

A Phase 1 Heritage Impact Assessment was conducted by Palaeo Field Services, the report is available under **Appendix 11**. Please see the findings below:

**Locality data**

The study area was divided into three zones for the purpose of the report, which combined, covers approximately 300 ha of relatively flat agricultural land and severely degraded mining areas (Fig. 3).

General Site Coordinates:

Area 1) 25°43'17.95"S 27°35'19.56"E

Area 2) 25°43'59.31"S 27°35'17.35"E

Area 3) 25°44'26.99"S 27°35'24.89"E



Figure 3: Layout of site according to descriptions in report

**Field Assessment**

Area 1 has been impacted by ongoing mining activities, as witnessed by multiple excavation, diggings and overgrown rubble heaps (Fig. 7). Areas 2 and 3 have been altered by ongoing farming activities (Fig. 8 & 9). A foot survey and has indicated no evidence for Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no evidence of Iron Age structures, rock engravings or historical buildings older than 60 years within the study areas. A large cemetery is located near the northern boundary of Area 1 (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E; Fig.10 & 11).

**Impact Statement**

Palaeontologically insignificant Bushveld Complex granites that are capped by superficial (Quaternary) deposits considered to be of low palaeontological sensitivity underlie the study area. The study area is located within a region that is known for rock engraving sites and that bears rich archaeological as well as historical evidence of early migration, fission and subsequent development of early Sotho-Tswana people, leading to the establishment of numerous Iron Age settlements and complexes. However, the field assessment has indicated the there is no above-ground evidence of prehistoric structures, historical buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the demarcated area (Table 1). The cemetery is rated Local Significance (Grade 3A). The rest of the development footprint is rated Generally Protected C (GP.C).

**Recommendations**

According to Section 36(3) of the National Heritage Resources Act 25 of 1999 no person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

*It is recommended that the graveyard is included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a 20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities. It will be necessary to ensure that the graveyard is accessible to the relatives of the deceased.*

Cultural Heritage in South Africa (includes all heritage resources) is protected by the **National Heritage Resources Act (Act 25 of 1999) (NHRA)**. According to Section 3 of the Act, all Heritage resources include “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

If such resources are found during the mining or development activities, they shall not be disturbed without a permit from the relevant heritage resource Authority, which means that before such sites are disturbed by development it is incumbent on the developer to ensure that a heritage impact assessment is done and the Provincial Heritage Resources Authority and SAHRA must be contacted immediately and work must stop.

If anything of Archaeological and/or paleontological significance is found during the construction and operational phase of the mine the following applies:

- NHRA 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- NHRA 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- NHRA 38(4)e – The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.

#### **Chance Find Procedure**

- If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.



- A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sandbags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

#### ➤ Potential impacts on Agricultural:

From the Agricultural point of view, mining may have impact directly on any socio-economic aspects since this will be affect the farming activities, food security and have financial impact to the landowners using the farms for agricultural activities.

An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under Appendix 11. Please see the findings below:

- *the majority of the current land use of the land should be adjusted to reflect MINING ACTIVITIES (old and new) on a major disturbed area of 188 ha;*
- *the rest of the application area covers an surface area (area 1 &2) that is used for AGRICULTURAL ACTIVITIES. The majority of the area (soil covered area) is being utilized for grazing (cultivated and natural).*
- *Most of the original vegetation cover was replaced by cultivated fields (planted pastures) and fruit trees.*
- *The environmental sensitivity as identified by the screening tool should not be VERY HIGH , but LOW sensitivity for the MINING AREA and MEDIUM environmental sensitivity for the Area 1 & 2 Agricultural area.*
- *Majority of the surface area is (incl. soil cover) disturbed by mining activities such as , opencast voids, waste rock dumps dumped on top of topsoil, gravel access roads, ore stockpiles , topsoil dumps, berms, rehabilitated waste rock dumps, etc. Vegetation cover totally disturbed by mining activities. Shallow soils and rock outcrops found in this area. During 2009 already a portion of the surface area has been regarded “ Degraded land”.*

#### ➤ Potential impacts on groundwater:

A Geohydrological investigations was undertaken by Afri GS 95 (Pty) Ltd, the report is available under Appendix 11. Please see the findings below:

- *Groundwater will be utilised in the chrome beneficiation process. Proposed groundwater abstraction is estimated at 85.71 m<sup>3</sup>/day.*
- *Two boreholes were located within the project area and both were sampled for macro-chemical analysis. Water quality results suggest that groundwater at both boreholes is Class IV (Unacceptable quality) due to elevated Total hardness and Magnesium (BH 02 Class III).*

Class 3	Poor water quality	<b>Drinking health:</b> Poses a risk of chronic health effects, especially in babies, children and the elderly .
		<b>Drinking aesthetic:</b> Bad taste and appearance may lead to rejection of the water.
		<b>Food preparation:</b> Poses a risk of chronic health effects, especially in children and elderly.
		<b>Bathing:</b> Significant effects on bathing or on bath fixtures
Class 4	Unacceptable water quality	<b>Laundry:</b> Significant effects on laundry or on fixtures.
		<b>Drinking health:</b> Severe acute health effects, even with short term use.
		<b>Drinking aesthetic:</b> Taste and appearance will lead to rejection of the water.
		<b>Food preparation:</b> Severe acute health effects, even with short term use.
		<b>Bathing:</b> Serious effects on bathing or on fixtures
		<b>Laundry:</b> Serious effects on laundry or on fixtures.

- The calculations for available water in aquifer storage indicate aquifer storage of 289 370.24 m<sup>3</sup>
- Sustainable aquifer yield calculations indicate an average sustainable yield on the property of 136.82 m<sup>3</sup>/day (i.e 1.58 l/sec).
- It is recommended to install flow meters at each production borehole
- At the study site two main aquifers can be distinguished which are the weathered zone aquifer and deep fractured (bedrock) aquifer.
- Groundwater generally flows in a north north westerly (NNW) direction through the study area. Groundwater also appears to flow in the direction of the major drainage features within the project area.
- Chrome mining & processing activities generally have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range phosphate PO<sub>4</sub><sup>2-</sup> (mg/l), Sulphates PO<sub>4</sub><sup>2-</sup> (mg/l) and Chromium (total) Cr (mg/l).
- It is thus recommended to drill at least two monitoring boreholes. One upstream and the other downstream of the study site.
- The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa & Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.

### 3.7.3. Total Hardness - Remedial action

The following processes are employed in the treatment of water hardness i.e. as recommended by the Department of Water and Sanitation:

- Base Exchange softening is used to replace the calcium and magnesium in the water with non-hardness forming sodium in ion exchange columns regenerated with a sodium chloride brine. This is a simple technique and can be operated successfully on a household scale.
- Demineralisation in mixed bed ion exchange columns may be used to remove all hardness-forming ions together with other ions in solution, where a particularly low salinity water is required.
- However, water is commonly softened by the addition of lime followed by re-carbonation or by using an ion exchange technique, sometimes preceded by a precipitation step if hardness in the feed water is particularly high.

It is recommended to treat groundwater from both boreholes before human consumption.

### 3.10. Short & long term potential groundwater abstraction impact on existing users

Groundwater abstraction yield estimates as derived from the FC and Cooper Jacob Methods are conservative and as such groundwater drawdown is expected to be between 5 – 10 m at the recommended duty cycles. There is no severe groundwater impact on groundwater levels expected in the immediate vicinity of the Mine. However, further study in the form of a numerical groundwater model is recommended to evaluate long term groundwater potential impacts on groundwater levels and aquifer storage.

### 4.6. Potential Impact on neighbouring streams & groundwater dependent ecosystems

It is recommended to drill at least two monitoring boreholes as per section 4.5. A full chemical analysis should be conducted at these proposed monitoring boreholes to establish baseline water chemistry. Additional testing should be conducted for Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range

phosphate PO<sub>4</sub> 2- (mg/l), Sulphates PO<sub>4</sub> 2- (mg/l) and Chromium (total) Cr (mg/l). Groundwater chemistry over a period of time will determine the potential impact on the environment & serve as an evaluation tool of the waste water treatment efficiency employed by the mine.

#### **Summary & recommendations**

- This report provides the necessary information as required by the delegated authority, the Department of Water and Sanitation (DWS), in support of a Water Use licence application for Bila Chrome Mine.
- Groundwater will be utilised in the chrome beneficiation process. Proposed groundwater abstraction is estimated at 85.71 m<sup>3</sup>/day.
- Data from the Groundwater Resource Assessment Phase II (GRA II) study has been utilized in this study. GRA II is a model for estimation of groundwater allocation scenarios & standardized groundwater parameters.
- Bila Chrome Mine is located in Quaternary catchment A21K with average static water level = 15.81 m; an average weathered thickness of 23.65 m and average fractured aquifer thickness of 140.01 m; the calculated total aquifer thickness = 163.66 m.
- Two boreholes were located within the project area and both were sampled for macro-chemical analysis. Water quality results suggest that groundwater at both boreholes is Class IV (Unacceptable quality) due to elevated Total hardness and magnesium.
- 24 Hour constant discharge tests have been conducted at two existing boreholes on the property & pump test analysis has been done using the FC Method & Cooper Jacob approximations.
- Both boreholes are recommended for production processes at the Mine & borehole equipping recommendations are as shown in Table 5.
- The calculations for available water in aquifer storage indicate aquifer storage of 289 370.24 m<sup>3</sup>
- Sustainable aquifer yield calculations indicate an average sustainable yield on the property of 136.82 m<sup>3</sup>/day (i.e 1.58 l/sec).
- It is recommended to install flow meters at each production borehole
- The regional geology indicates to be of the Bushveld Complex. The Bushveld Complex is seated in the central northeast portion of the Kaapvaal craton and is regarded as having been emplaced in an intra-cratonic, anorogenic setting possibly related to mantle pluming.
- The geology of the study area is dominated by pyroxenite, norite and anorthositic rocks of the Ruighoek Pyroxenite, Mathlagame Norite-Anorthosite and Eerlyk bronzite & Kroondal norite formations which all occur within the Rustenburg Layered Suite (RLS).
- At the study site two main aquifers can be distinguished which are the weathered zone aquifer and deep fractured (bedrock) aquifer.
- Groundwater generally flows in a north north westerly (NNW) direction through the study area. Groundwater also appears to flow in the direction of the major drainage features within the project area.
- Chrome mining & processing activities generally have a potential negative impact on Acidity (pH), Temperature (oC), High range Iron Fe<sup>3+</sup> (mg/l), Free chlorine Cl<sup>-</sup> (mg/l), High range nitrogen NO<sub>3</sub><sup>-</sup> (mg/l), Low range phosphate PO<sub>4</sub> 2- (mg/l), Sulphates PO<sub>4</sub> 2- (mg/l) and Chromium (total) Cr (mg/l).
- It is thus recommended to drill at least two monitoring boreholes. One upstream and the other downstream of the study site.
- The overall DSVI rating Index for Bila Chrome Mine area is 11.83. According to the DRASTIC Specific Vulnerability Index, groundwater vulnerability in this area is insignificant. However according to the groundwater vulnerability map (Musekiwa & Majola, 2011), the mine and surrounding areas can be categorised as having a Moderate vulnerability classification.

#### **➤ Potential impacts on the air quality**

An Air Quality Impact Assessment (AQIA) was conducted by Rayten Engineering Solutions (Pty) Ltd. The report is available under **Annexure 11**.

*Rayten believes the commencement of full mining operations at the proposed Bila Elandskraal mine can go ahead if the dust mitigation measures recommended in this AQIA are strictly implemented as much as possible, where feasible, in order to reduce dust emissions at the proposed mine. Emissions associated with the proposed mine are predicted to have a low to medium negative impact on air quality if mitigation measures are implemented, with no fatal flaws identified after the implementation of mitigation measures.*

### ➤ Potential impacts from blasting

A Blast Impact Assessment was conducted by Blast Management & Consulting, the report is available under **Appendix 11**.

Please see some of the specialist findings below:

*Blast Management & Consulting (BMC) was contracted as part of Environmental Impact Assessment (EIA) to perform an initial review of possible impacts with regards to blasting operations in the proposed opencast mining operation.*

*Ground vibration, air blast, fly rock and fumes are some of the aspects as a result from blasting operations. The report evaluates the effects of ground vibration, air blast and fly rock and intends to provide information, calculations, predictions, possible influences and mitigations of blasting operations for this project.*

*The evaluation of effects yielded by blasting operations was evaluated over an area as wide as 3500 m from the mining area considered. The range of structures observed is typical roads (tar and gravel), low-cost houses, corrugated iron structures, industrial buildings, brick and mortar houses, power lines/pylons.*

*The location of structures around the Pit area is such that the charge evaluated showed possible influences due to ground vibration. The closest structures observed are the Road, Mine Buildings/Structures, Hydrocencus, Dam and Power Lines/Pyllons. The ground vibration levels predicted for these POI's ranged between 0.4 mm/s and 788.0 mm/s for structures surrounding the open pit areas. The expected levels of ground vibration exceed limits for seven specific structures (POI's 2, 3, 5, 9, 16, 17 and 190) and will require specific mitigations in the way of adjusting charge mass per delay to reduce the levels of ground vibration. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage.*

*Air blast predicted showed greater concerns for opencast blasting. The current accepted limit on air blast is 134 dBL. Damages are only expected to occur at levels greater than 134dB. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pits are located such that "free blasting" – meaning no controls on blast preparation – will not be possible.*

*Prediction shows that air blast will be greater than 134 dB at distance of 390 m and closer to pit boundary. Infrastructure at the pit areas such as roads and power lines/pyllons, are present, but air blast does not have any influence on these installations.*

*Fly rock remains a concern for blasting operations. Based on the drilling and blasting parameters values for a possible fly rock range with a safety factor of 2 was calculated to be 493 m. The absolute minimum unsafe zone is then the 493 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded. Best practices should be implemented at all times. The occurrence of fly rock can be mitigated but the possibility of the occurrence thereof can never be eliminated.*

*Specific actions will be required for the pit area such as Mine Health and Safety Act requirements when blasting is done within 500 m from structures and mining with 100 m for structures. The Mine Buildings/Structures, Dam, Road, Power Lines/Pyllons and Hydrocencus falls within the 500 m range from the pit area.*

*The pit area is located such that specific concerns were identified and addressed in the report. There are public structures located very close to the pit boundary. Specific mitigation will be required for these concerns. Recommendation have been made regarding these.*

*A minimum of 50 m boundary must be maintained between the surface blasting and the underground blasting operations and a maximum of 620 kg can be allowed safely. At 56 m 620 kg is expected to yield 150 mm/s. However it is recommended that single hole firing is maintained when blasting next to the underground workings.*

*This concludes this investigation for the proposed Elandsdraal Chrome Mine Project. There is no reason to believe that this operation cannot continue if attention is given to the recommendations made.*

➤ **Potential impacts on land use:**

An Agricultural Compliance Statement conducted by Celtis Environmental Solutions to verify the site sensitivity. The report is available under Appendix 11. Please see the findings below:

The majority of the surface area (188 ha) is already being impacted on by mining activities ( current and old). Area 1 (41,6ha) & Area 2 (61,2 ha) still have some agricultural activity taking place.

According to the Terrestrial Biodiversity Impact Assessment (**Appendix 11**):

*“The area is heavily disturbed by current prospecting activities on the northern part of the application area. Over the northern part of the application area there are mining related infrastructure, such as a workshop area, fence lines, mine roads and access roads to the prospecting area, dumps of various sizes and purposes, quarries and excavations. The central and southern part of the project area is currently utilised as agricultural land with cultivated fields and citrus orchards.”*

➤ **Potential social impacts:**

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks.

Bila Civil Construction (Pty) Ltd has an existing Prospecting Right on the proposed area with DMRE ref: NW30/5/1/1/2/12078PR (Part 2 amendment ref: NW-00118-PR/102).

According to the Mining Work Programme (**MWP, Appendix 9**), approximately 56 employment opportunities will be created during the construction and operational phase of the project.

➤ **Other potential negative impacts:**

(noise, dust, soil degradation, storm water, traffic, health and safety) associated with the operation of the facility are expected to be of low-high impact, of long terms and site specific. These can be mitigated or negated through the implementation of practical and appropriate mitigation measures.

➤ **Land use impacts:**

The mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody may definitely impact directly on any socio-economic aspects since this will affect the farming activities, food security and have financial impact to the landowners using the farms for agricultural activities.

All possible negative impacts and risks that have been identified in this report can be effectively mitigated and managed by implementing the migratory measures as set out in the Environmental Management Programme (EMPr) attached in Part B.

- (i) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred [site] development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers.

Kindly refer to **Figure 31** below



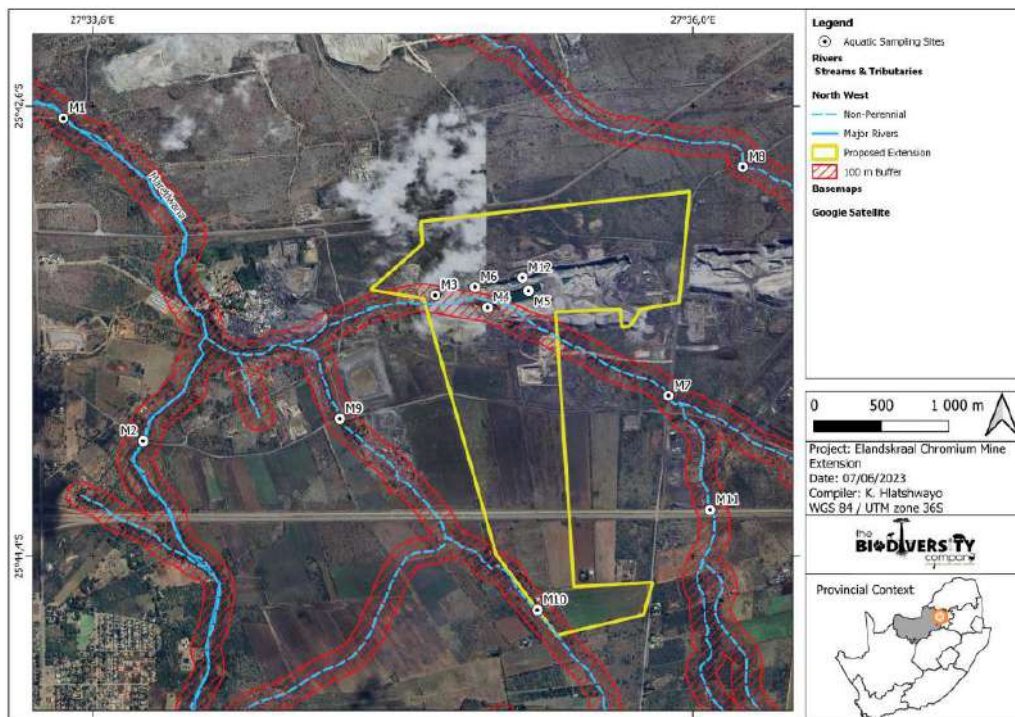


Figure 32: Riparian area delineation 100 m buffer for the Maretwana River as well as accompanied tributary for the project area.



Figure 33: 20m buffer around graveyard (HIA, Appendix 11)

(ii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

There are regional socio economic benefits due to the alluvial Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody being mined in the North West Province and greater knowledge is gained on the mineralogy of South Africa. All possible negative impacts and risks that have been identified in this report can be effectively mitigated and managed by implementing the mitigation measures as set out in the Environmental Management Programme (EMPr) attached in Part B. Significant adverse social environmental impacts are anticipated.

#### **M. PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR**

**Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed [impact management objectives, and the] impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.**

##### **Management objectives include:**

- Ensure that the mining activity does not cause pollution to the environment or harm to persons.
- Minimise production of waste.
- All mining activities must be conducted in a manner that minimises noise impact, litter, environmental degradation and health hazards i.e. injuries.
- The mine must be kept neat and tidy during waste handling to prevent unsightliness and accidents.

##### **Expected outcomes include:**

- Minimum impacts on the environment as a result of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody mining.
- Compliance with legislative requirements.
- Mine is neat and tidy and well managed.

#### **N. FINAL PROPOSED ALTERNATIVES.**

**(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)**

This alternative asks the question, if there is not, from an environmental perspective, a more suitable location for the proposed activity.

Portion 2, Portion 155 & Portion 156 of the farm Elandsdraal are preferred due to the sites underlying minerals applied for, therefore there will be no other alternative (i.e. to facilitate the movement of machinery, equipment, infrastructure).

#### **O. ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION.**

**(Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;)**

Mining operations in the area must be conducted in accordance with the Mining Work Programme (or any amendments to such MWP) and the approved Environmental Management Programme (EMPr).

Once mining has ceased the area must be rehabilitated and a closure certificate must be applied for in terms of Section 43 (3) of the MPRDA.

The applicant must take all necessary and reasonable steps to adequately safeguard and protect the environment, the mining area and any person/s using or entitled to use the surface of the mining area from any possible damage or injury associated with the activities of the mining area.

#### **P. DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE.**

**(Which relate to the assessment and mitigation measures proposed)**

The uncertainties in results are mostly related to the availability of information, time available to gather the relevant information as well as the sometimes subjective nature of the assessment methodology. In terms of addressing the key issues the EAP is satisfied that there are no major gaps in knowledge and that the report provide sufficient information to conduct the significance rating and provide the environmental authority with sufficient information to make an informed decision.



## **Q. REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED**

(and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;)

### **REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT.**

Based on the outcomes of the prospecting activities, the possibility to encounter further mineral reserves were identified.

The proposed Mining area is targeted as, historically, several Chrome Ore occurrences are known in the area, and a number of these have been exploited in the past. The prospecting activities deployed as a result of the bulk sampling exercise resulted in the trail mining of the mineral resources discovered and the testing of the mineral product into the market.

Trail mining (prospecting with bulk sampling) and its associated impacts have already commenced on the proposed project site and the area has been disturbed by agricultural activities. Taking the aforementioned into account it is clear that the expansion of the mining operations, as proposed by the applicant, will be the most suitable future land use for the site in terms of environmental and economic cost-benefit.

There is no reason to believe that from an environmental perspective this operation cannot continue if all mitigation measures are implemented.

### **CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION**

A monitoring programme must be established for the following environmental aspects:

- Surface Water Impacts (Quality, Quantity/ Habitat integrity, Toxicity)
- Groundwater Impacts (Quality, Ground water levels)
- Air Quality Impacts
- Noise impacts
- Waste Impacts
- Vegetation impacts
- Aquatic biomonitoring A
- n Alien Invasive Control Programme must be established in order to ensure that alien Invasive flora species do not become established in the area and especially do not spread or impact upon the nearby agricultural activities.
- A monitoring programme for recording blasting operations is recommended. The following elements should be part of such a monitoring program:
  - Ground vibration and air blast results;
  - Blast Information summary;
  - Meteorological information at time of the blast;
  - Video Recording of the blast;
  - Fly rock observations.

## **R. PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED.**

The expected life of the mine is expected to be ± 20 years.

**S. AN UNDERTAKING UNDER OATH OR AFFIRMATION BY THE EAP IN RELATION TO:**

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

The undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment report and the Environmental Management Programme report.

I, Ms. Lizanne Esterhuizen, Reg. EAP (EAPASA) herewith confirms

- A. the correctness of the information provided in the reports
- B. the inclusion of comments and inputs from stakeholders and I&APs ;
- C. the inclusion of inputs and recommendations from the specialist reports where relevant; and
- D. the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;

\_\_\_\_\_  
Signature of the environmental assessment practitioner:

**Milnex CC**

\_\_\_\_\_  
Name of company:

**06 July 2022**

\_\_\_\_\_  
Date:

**T. FINANCIAL PROVISION**

(where applicable, details of any financial provision[s] for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;)

**CALCULATION OF THE QUANTUM**

Applicant: Bila Civil Contractors, farm Elandskraal 469 JQ, District Brits Ref No.: NW 30/5/1/ MR  
 Evaluators: Milnex CC Date: Jun-23

No.	Description	Unit	A	B	C	D	E=A*B*C*D
			Quantity	Master Rate	Multiplication factor	Weighting factor 1	Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	1200	18,36	1	1	22032
2 (A)	Demolition of steel buildings and structures	m2	160	255,81	1	1	40929,6
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	376,99	1	1	0
3	Rehabilitation of access roads	m2	2000	45,78	1	1	91560
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	444,31	1	1	0
4 (A)	Demolition and rehabilitation of non-electrified railway lines	m	0	242,35	1	1	0
5	Demolition of housing and/or administration facilities	m2	48	511,63	1	1	24558,24
6	Opencast rehabilitation including final voids and ramps	ha	4	260391,13	0,52	1	541613,5504
7	Sealing of shafts adits and inclines	m3	0	137,33	1	1	0
8 (A)	Rehabilitation of overburden and spoils	ha	1	178800,11	1	1	178800,11
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0,5	222692,31	1	1	111346,155
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	646804,02	1	1	0
9	Rehabilitation of subsided areas	ha	0	149718,17	1	1	0
10	General surface rehabilitation	ha	1	141639,85	1	1	141639,85
11	River diversions	ha	0	141639,85	1	1	0
12	Fencing	m	200	161,57	1	1	32314
13	Water management	ha	0,2	53855,46	1	1	10771,092
14	2 to 3 years of maintenance and aftercare	ha	1	18849,41	1	1	18849,41
15 (A)	Specialist study	Sum	0			1	0
15 (B)	Specialist study	Sum				1	0
<b>Sub Total 1</b>							<b>121441,007</b>

1	Preliminary and General	145729,6809	weighting factor 2	145729,6809
			1	
2	Contingencies	121441,4007		121441,4007
<b>Subtotal 2</b>				<b>1481585,09</b>
<b>VAT (15%)</b>				<b>222237,76</b>
<b>Grand Total</b>				<b>1703823</b>

Bila Civil Contractors (Pty) Ltd has an existing Bank Guarantee t the amount of R2.2 million for the current Prospecting activities.

**A. Explain how the aforesaid amount was derived.**

The closure cost estimate provided above is aligned with the NEMA: Financial provision regulations, 2015. The amount was calculated by Milnex CC.

**B. Confirm that this amount can be provided for from operating expenditure.** (Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Mine Work Programme as the case may be).

**Financial Guarantee**

The financial guarantee for the rehabilitation for land disturbed by **Bila Civil Contractors (Pty) Ltd** will be submitted.

**Rehabilitation Fund**

**Bila Civil Contractors (Pty) Ltd** will also make provision for rehabilitation during closure by establishing a rehabilitation trust.

**U. DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY.**

(i) Any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and

None of the methodologies approved for the scoping report were deviated

**(ii) Motivation for the deviation.**

Not applicable

**V. ANY SPECIFIC INFORMATION THAT MAY BE REQUIRED BY THE COMPETENT AUTHORITY; AND**

**W. COMPLIANCE WITH THE PROVISIONS OF SECTIONS 24(4)(A) AND (B) OF THE ACT**

Read with Section 24 (3) (A) and (7) of the National Environmental Management Act (Act 107 of 1998). The EIA Report must include the:

**ii. Impact on the socio-economic conditions of any directly affected person.**

*(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as Appendix 2.19.1 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6. and 2.12. herein).*

Indirect socio-economic benefits are expected to be associated with the creation of employment.

Mining may have impact directly on any socio-economic aspects since this will be affect the farming activities and have financial impact to the landowners using the farms for agricultural activities.

**iii. Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.**

A Phase 1 Heritage Impact Assessment was conducted by Palaeo Field Services, the report is available under **Appendix 11**. Please see the findings below:

**Locality data**

*The study area was divided into three zones for the purpose of the report, which combined, covers approximately 300 ha of relatively flat agricultural land and severely degraded mining areas (Fig. 3).*

General Site Coordinates:

Area 1) 25°43'17.95"S 27°35'19.56"E

Area 2) 25°43'59.31"S 27°35'17.35"E

Area 3) 25°44'26.99"S 27°35'24.89"E



Figure 3: Layout of site according to descriptions in report

### **Field Assessment**

Area 1 has been impacted by ongoing mining activities, as witnessed by multiple excavation, diggings and overgrown rubble heaps (Fig. 7). Areas 2 and 3 have been altered by ongoing farming activities (Fig. 8 & 9). A foot survey and has indicated no evidence for Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no evidence of Iron Age structures, rock engravings or historical buildings older than 60 years within the study areas. A large cemetery is located near the northern boundary of Area 1 (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E; Fig.10 & 11).

### **Impact Statement**

Palaeontologically insignificant Bushveld Complex granites that are capped by superficial (Quaternary) deposits considered to be of low palaeontological sensitivity underlie the study area. The study area is located within a region that is known for rock engraving sites and that bears rich archaeological as well as historical evidence of early migration, fission and subsequent development of early Sotho-Tswana people, leading to the establishment of numerous Iron Age settlements and complexes. However, the field assessment has indicated there is no above-ground evidence of prehistoric structures, historical buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the demarcated area (Table 1). The cemetery is rated Local Significance (Grade 3A). The rest of the development footprint is rated Generally Protected C (GP.C).

### **Recommendations**

According to Section 36(3) of the National Heritage Resources Act 25 of 1999 no person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

It is recommended that the graveyard is included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a 20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities. It will be necessary to ensure that the graveyard is accessible to the relatives of the deceased.

Cultural Heritage in South Africa (includes all heritage resources) is protected by the **National Heritage Resources Act (Act 25 of 1999) (NHRA)**. According to Section 3 of the Act, all Heritage resources include “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

If such resources are found during the mining or development activities, they shall not be disturbed without a permit from the relevant heritage resource Authority, which means that before such sites are disturbed by development it is incumbent on the developer to ensure that a heritage impact assessment is done and the Provincial Heritage Resources Authority and SAHRA must be contacted immediately and work must stop.

If anything of Archaeological and/or paleontological significance is found during the construction and operational phase of the mine the following applies:

- NHRA 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;

- NHRA 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offence in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- NHRA 38(4)e – The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.

#### **Chance Find Procedure**

- If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
- A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sandbags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossil finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

#### **Other matters required in terms of sections 24(4)(a) and (b) of the Act.**

*(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as Appendix 4).*

Portion 2, Portion 155 & Portion 156 of the farm Elandsdraal are preferred due to the sites underlying geology as well as site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people).

The specific site has been chosen for its mineral resources thus making an alternative site selection null and void.

## PART B

### ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

**An EMPr must comply with section 24N of the Act and include—**

**A. DETAILS OF—**

- (i) the EAP who prepared the EMPr; and
- (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;

Milnex CC	Qualifications	Contact details
Lizanne Esterhuizen	Honours Degree in Environmental Science & Registered EAP (EAPASA), Reg No: 2021/4429 (refer to <b>Appendix 1</b> )	Tel No.: (018) 011 1925 Fax No. : (053) 963 2009 e-mail address: <a href="mailto:lizanne@milnex-sa.co.za">lizanne@milnex-sa.co.za</a>

It is hereby confirmed that the requirements for the provision of the details and expertise of the EAP are contained in Part A, section 1(a) as required. The Curriculum Vitae for the responsible EAP is contained in **Appendix 1 and 2**.

**B. DESCRIPTION OF THE ASPECTS OF THE ACTIVITY**

**(a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;)**

It is hereby confirmed that the requirements to describe the aspects of the activity that are required by the EMP is already included in Part A, section 1(h).

**C. COMPOSITE MAP**

**(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 [any areas that] should be avoided, including buffers;)**

Refer to Site Layout Map below and attached as in **Appendix 4**.

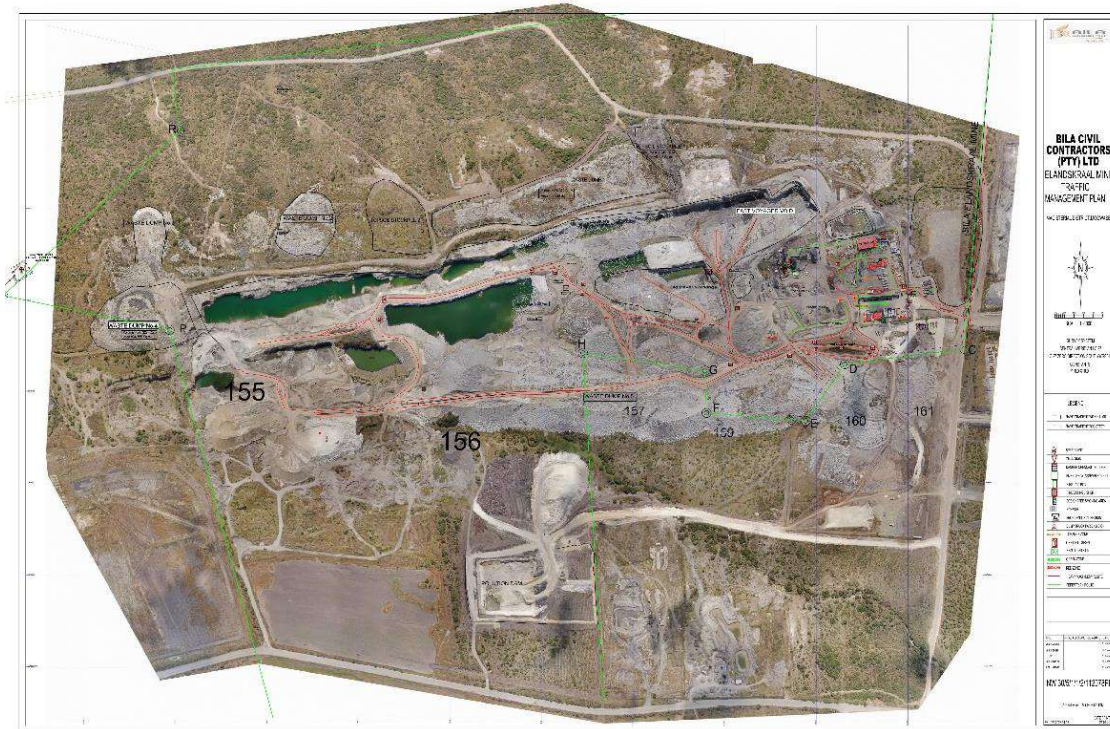


Figure34: Composite Map (Site Layout Map)

Draft



**D. A DESCRIPTION OF THE IMPACT MANAGEMENT [OBJECTIVES] 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) **Determination of closure objectives.** (ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

Closure objectives for the Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody mine will aim to ensure that the residual post-closure impacts be minimized and be acceptable to relevant parties. To achieve these closure objectives, the following will be implemented:

**STOCKPILE AREAS AND THE WASTE ROCK DUMP**

The following activities will take place at closure:

- Any residue and overburden stockpiles need to be removed and placed in the base of the final void.
- Topsoil will be spread over all disturbed areas and re-vegetated.

**OPEN PIT**

The following activities will take place at closure and during concurrent rehabilitation:

- As the opencast mining progresses, the voids created will be backfilled with overburden from the progressive opencast mining, and then overlain by the various soil horizons and rehabilitated;
- There will be a final void at the end of life of mine and this will be filled with overburden material;
- The area will be blended in with the surrounding landscape and allowed to be free draining;
- Once the void has been backfilled, 300mm thick topsoil or soft overburden in place of soil will be spread on rehabilitated areas; and
- Once placed, the “growth medium” should then be fertilised, ripped and re-vegetated. A small topsoil stockpile should be left for remedial work.

**INFRASTRUCTURE AREAS**

The following activities will take place at closure:

- All surface plant, buildings and equipment will be removed from site;
- Foundations will be removed to a meter (1m) below surface and placed in the final void or disposed of at a registered landfill site if required;
- The surface areas will be levelled and vegetated

**SEALING OF THE SHAFT (IF APPLICABLE)**

The most important aspect in sealing a shafts is to ensure that the safety considerations associated with such a shaft are met. For the shaft to be sealed adequately, inert building rubble must be backfilled into the shaft, thereby partially plugging the shaft. The sealant is reinforced by a concrete cap, dimensions of which are governed by the size and nature of the shaft. After sealing the shaft, the final area will be covered with, sub-soil and 300 mm topsoil and vegetated. The possible formation of methane underground once the shaft has been sealed needs to be taken into account by placing venting boreholes strategically in the area.

**ACCESS ROADS**

Roads required for agricultural activities will be left. All others will be ripped and vegetated.

**POWER LINE AND ELECTRICAL INFRASTRUCTURE**

These will be removed from site where there is not reasonable prospect they will be needed for agricultural or housing activities.

**POST CLOSURE PHASE GROUNDWATER QUALITY**

Test groundwater quality at monitoring points and address accordingly dependent on result.

## **E. A DESCRIPTION AND IDENTIFICATION OF IMPACT MANAGEMENT OUTCOMES REQUIRED FOR THE ASPECTS CONTEMPLATED IN PARAGRAPH (D);]**

The above goal is underpinned by more specific objectives listed below.

### **1. Upfront planning/development**

To provide overall guidance and direction to closure planning and/or the implementation of progressive closure measures over the remaining over the mining life.

### **2. Physical stability**

To ensure that mining residue will not compromise post-closure land use and be sustainable long-term landforms.

- Closure, removal and disposal of all surface infrastructure that has no beneficial post-closure use.
- Shaping and vegetating the remaining earth embankments, trenches, etc. to stabilise slopes and integrate with surrounding topography.

### **3. Environmental quality**

To ensure that local environmental quality is not adversely affected by possible physical effects arising from mining operations and the mining site after closure. This will be achieved by:

- Avoiding and/or limiting the following during mining operations which could result in adverse effects that could not be readily addressed and/or mitigated at mine closure.
  - Possible shallow groundwater contamination adversely affecting the quality of the local water resource and its beneficial use.
- Limiting the potential for dust generation on the rehabilitated mining site that could cause nuisance and/or health effects to surrounding landowners;
- Limiting the possible adverse water quality and quantity effects arising from the rehabilitated mining site to ensure that long term beneficial use of local resources is not compromised;
- Conducting soil clean-up/remediation to ensure that the planned land use could be implemented and maintained;

### **4. Health and safety**

To limit the possible health and safety treats due to terrain hazards to humans and animals utilizing the rehabilitated mining site after closure by:

- Demonstrating through upfront soil testing that any resultant inorganic and organic pollution present on the site is acceptable;
- Removal of potential contaminants such as hydrocarbons and chemicals off site;
- Shaping of embankments and trenches to safe slopes and reintegrating of these into surrounding topography.
- Ensuring that the environmental quality as reflected above is achieved.

### **5. Land capability / land use**

To ensure that the required land capability to achieve and support the planned land use can be achieved over the mining site by:

- Clean-up and reclamation of contaminated soil areas in order not to compromise the above land use planning earmarked for implementation;
- To ensure that the overall rehabilitated mining site is free draining
- Transferring mining related surface infrastructure to third parties for beneficial use after closure.

### **6. Aesthetic quality**

To ensure that the rehabilitated mining site will display, at a minimum, an acceptable aesthetic appearance that would not compromise the planned land use by leaving behind:

- A mining area that is properly cleared-up with no fugitive/scattered waste piles
- Rehabilitated mining area that is free draining and disturbed areas that are suitably vegetated.
- Rehabilitated mining residues that are suitably landscaped, blending with the surrounding environment as far as possible.
- Shaped and rehabilitated terrace and hard stand areas, roughly emulating the local natural surface topography.

### **7. Landscape viability**

To create a landscape that is self-sustaining and over time will evolve/converge to the desired ecosystem structure, function and composition by:

- Conducting surface profiling, with associated material movement optimisation, to obtain a landscape resembling the natural landscapes to support the succession trajectory towards a climax ecological system.
- Establishing woody patches and create “rough and loose” areas for pioneer specie establishment around the respective patches.
- Establishing pioneer species as follows:
  - Collected and prepared seeds for broad casting;
  - Seedlings grown on on-site nursery;
  - Cuttings collected from surrounding veld areas;
- Conducting rehabilitation monitoring and corrective action as required.

#### **8. Terrestrial Biodiversity**

To encourage, where appropriate, the re-establishment of native vegetation on the rehabilitated mine site such the terrestrial biodiversity is largely re-instated over time, by:

- Stabilising disturbed areas to prevent erosion in the short- to medium term until a suitable vegetation cover has established; and
- Establishing viable self-sustaining vegetation communities of local fauna, as far as possible.

#### **9. Aquatic Biodiversity**

- Once the pits have been backfilled with overburden and the landscape contoured the rehabilitation of the area must begin in order to bring the land back to a state as close to the ecological state before the mine was constructed, as possible. The largest component of this will be reintroducing topsoil and the revegetation of the landscape with indigenous species.

### **F. A DESCRIPTION OF PROPOSED IMPACT MANAGEMENT ACTIONS, IDENTIFYING THE MANNER IN WHICH THE IMPACT MANAGEMENT [OBJECTIVES AND] OUTCOMES CONTEMPLATED IN PARAGRAPH (D) [AND (E)] WILL BE ACHIEVED, AND MUST, WHERE APPLICABLE, INCLUDE ACTIONS TO —**

**Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.**

The Rehabilitation & Closure Plan is attached as **Appendix 8**.

**Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.**

**CALCULATION OF THE QUANTUM**

Applicant: **Bila Civil Contractors, farm Elandsdraal 469 JQ, District Brits** Ref No.: **NW 30/5/1/ MR**  
 Evaluators: **Milnex CC** Date: **Jun-23**

No.	Description	Unit	A	B	C	D	E=A*B*C*D
			Quantity	Master Rate	Multiplication factor	Weighting factor 1	Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	1200	18,36	1	1	22032
2 (A)	Demolition of steel buildings and structures	m2	160	255,81	1	1	40929,6
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	376,99	1	1	0
3	Rehabilitation of access roads	m2	2000	45,78	1	1	91560
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	444,31	1	1	0
4 (A)	Demolition and rehabilitation of non-electrified railway lines	m	0	242,35	1	1	0
5	Demolition of housing and/or administration facilities	m2	48	511,63	1	1	24558,24
6	Opencast rehabilitation including final voids and ramps	ha	4	260391,13	0,52	1	541613,5504
7	Sealing of shafts adits and inclines	m3	0	137,33	1	1	0
8 (A)	Rehabilitation of overburden and spoils	ha	1	178800,11	1	1	178800,11
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	0,5	222692,31	1	1	111346,155
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	646804,02	1	1	0
9	Rehabilitation of subsided areas	ha	0	149718,17	1	1	0
10	General surface rehabilitation	ha	1	141639,85	1	1	141639,85
11	River diversions	ha	0	141639,85	1	1	0
12	Fencing	m	200	161,57	1	1	32314
13	Water management	ha	0,2	53855,46	1	1	10771,092
14	2 to 3 years of maintenance and aftercare	ha	1	18849,41	1	1	18849,41
15 (A)	Specialist study	Sum	0			1	0
15 (B)	Specialist study	Sum				1	0
<b>Sub Total 1</b>							<b>1214414,007</b>

1	Preliminary and General	145729,6809	<b>weighting factor 2</b>	145729,6809
			<b>1</b>	
2	Contingencies		121441,4007	121441,4007
<b>Subtotal 2</b>				<b>1481585,09</b>
<b>VAT (15%)</b>				<b>222237,76</b>
<b>Grand Total</b>				<b>1703823</b>

**Bila Civil Contractors (Pty) Ltd has an existing Bank Guarantee t the amount of R2.2 million for the current Prospecting activities.**

- a. **Confirm that the financial provision will be provided as determined.**

**Financial Guarantee**

The financial guarantee for the rehabilitation for land disturbed **Bila Civil Contractors (Pty) Ltd** will be submitted

**Rehabilitation Fund**

**Bila Civil Contractors (Pty) Ltd** will also make provision for rehabilitation during closure by establishing a rehabilitation trust.

## IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

### Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES  E.g. For mining,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.)	PHASE  (of operation in which activity will take place.  State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	SIZE AND SCALE of disturbance  (volumes, tonnages and hectares or m <sup>2</sup> )	MITIGATION MEASURES  (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	COMPLIANCE STANDARDS WITH  (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	TIME PERIOD FOR IMPLEMENTATION  Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity Or. Upon the cessation of mining, bulk sampling or alluvial diamond mining as the case may be.
Clearance of vegetation	Construction and operation phase	Application area: 304,8259 hectares	<p>If the development is approved, contractors must ensure that no mammalian species are trapped, hunted or killed. If the development is approved, every effort should be made to confine the footprint to the blocks allocated for the development and have the least possible edge effects on the surrounding area. The EMP also provides numerous mitigation measures.</p> <p>The potential impacts associated with the possible damage to, and loss of farmland should be effectively mitigated. The aspects that should be covered include:</p> <ol style="list-style-type: none"> <li>1. The site should be fenced off prior to commencement of construction activities;</li> </ol>	Compliance with Duty of Care as detailed within NEMA	Duration of operations on the mining activities.

			<ol style="list-style-type: none"> <li>2. The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be confined to the fenced off area and minimised where possible;</li> <li>3. An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;</li> <li>4. All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase if possible;</li> <li>5. The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. Specifications for the rehabilitation are provided throughout the EMP – section (f) of the EMP.</li> <li>6. The implementation of the Rehabilitation Programme should be monitored by the ECO.</li> <li>7. Any activities that take place within 32 meters of a wetland or watercourse or the 1:100 year flood lines will require authorisation in terms of the relevant regulations of NEMA, however as far as possible infrastructure should be placed outside of wetlands and / or buffer lines.</li> <li>8. No stockpiling should take place within a watercourse or the 32m buffer.</li> <li>9. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds</li> <li>10. Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed stream banks;</li> <li>11. Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities, particularly as the soils in the study area are prone to erosion;</li> <li>12. All areas should be re-sloped and top-soiled where necessary and reseeded with indigenous grasses to stabilise the loose material;</li> <li>13. Edge effects such as erosion must be strictly monitored and managed;</li> <li>14. Rehabilitation must ensure that the function are reinstated in such a way as to ensure the ongoing functionality of the watercourse systems at pre-mining levels.</li> <li>15. Any areas where bank failure is observed, due to the mining impacts, should be immediately repaired;</li> <li>16. As far as possible the existing road network should be utilised, minimising the need to develop new access routes resulting in an</li> </ol>		
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			<p>increased impact on the local environment. Should temporary roads or access routes be necessary and unavoidable, proper planning must take place and the site sensitivity plan must be taken into consideration. If additional roads are required, then wherever feasible such roads should be constructed a distance from the more sensitive riparian areas and not directly adjacent thereto. If crossings are required they should cross the systems at right angles, as far as possible to minimise impacts in the receiving environment;</p> <p>17. Stabilisation of banks by employing one of the individual techniques below or a combination thereof, is essential, given the inherent susceptibility of the soils to erosion. Such measures include:</p> <ul style="list-style-type: none"> <li>• Re-sloping of banks to a maximum</li> <li>• Revegetation of re-profiled slopes;</li> <li>• Temporary stabilisation of slopes using geotextiles; and</li> <li>• Installation of gabions and reno-mattresses.</li> </ul> <p>18. To prevent the further erosion of soils, management measures may include berms, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible to erosion;</p> <p>19. Install erosion berms during construction to prevent gully formation:</p> <p>20. Berms every 50m should be installed where any disturbed soils have a slope of less than 2%,</p> <p>21. Berms every 25m where the track slopes between 2% and 10%,</p> <p>22. Berms every 20m where the track slopes between 10% and 15% and</p> <p>23. Berms every 10m where the track slope is greater than 15%;</p> <p>24. Sheet runoff from access roads should be slowed down by the strategic placement of berms and sandbags;</p> <p>25. All soils compacted as a result of construction activities falling outside of project areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat;</p> <p>26. As far as possible, all rehabilitation activities should occur in the low flow season, during the drier winter months.</p> <p><b>Mitigation measures:</b></p>		
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			<ul style="list-style-type: none"> <li>• Vegetation clearing areas should be kept to a minimum and restricted to the proposed open pit site.</li> <li>• Do not disturb nests, breeding sites or young ones. Do not attempt to kill or capture snakes unless directly threatening the safety of employees.</li> <li>• Dogs or other pets are not allowed to the worksite as they are threats to the natural wild animal</li> <li>• A low speed limit should be enforced on site to reduce wild animal-vehicle collisions</li> <li>• Speed humps will need to be in place in order to assist in restricting truck drives from speeding</li> <li>• No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site.</li> <li>• Severe contractual fines must be imposed and immediate dismissal on any contract employee who is found attempting to snare or otherwise harms remaining faunal species.</li> <li>• Hunting weapons are prohibited on site.</li> <li>• Contract employees must be educated about the value of wild animals and the importance of their conservation.</li> <li>• The ECO must conduct regular site inspections of removing any snares or traps that have been erected.</li> <li>• Employees and contractors should be made aware of the presence of, and rules regarding, flora and fauna through suitable induction training and on-site signage.</li> <li>• Ensure that the colours used to paint the buildings including the roof are blending to the environment</li> </ul> <p><b>Please see the specialist mitigations table blow.</b></p>		
<p>Construction of roads:</p> <p>An access road will be established using an existing intersection. The existing road, stretching ±900m North from the intersection to Bila Civil's entrance, and is also used by Samancor or Samancor contractors.</p>	<p>Construction and operation phase</p>		<ol style="list-style-type: none"> <li>1. The Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a "NO ENTRY for Mining vehicles" sign.</li> <li>2. Construction routes and required access roads must be clearly defined.</li> <li>3. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance.</li> <li>4. Soils compacted by construction/Mining activities shall be deep ripped to loosen compacted layers and re-graded to even running levels.</li> </ol>	<p>Compliance with Duty of Care as detailed within NEMA</p>	<p>Duration of operations on the mining activities.</p>



			<ol style="list-style-type: none"> <li>5. The contractor must ensure that damage caused by related traffic to the gravel access road is repaired continuously. The costs associated with the repair must be borne by the contractor;</li> <li>6. Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport the gravel are fitted with tarpaulins or covers;</li> <li>7. All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.</li> <li>8. Speed humps will need to be in place in order to assist in restricting truck drives from speeding</li> </ol>		
<p>Mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody</p> <p>Soils and geology</p>	Construction and operation phase	Application area: 304,8259 hectares	<ol style="list-style-type: none"> <li>1. The Contractor should, prior to the commencement of earthworks determine the average depth of topsoil (If topsoil exists), and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas.</li> <li>2. Care must be taken not to mix topsoil and subsoil during stripping.</li> <li>3. The topsoil must be conserved on site in and around the pit area.</li> <li>4. All topsoil must be stockpiled and eventually replaced in an orderly manner during rehabilitation phase.</li> <li>5. Mining which includes the initial removal of the topsoil should be done in a phased manner in areas earmarked for definite opencast mining activities in accordance to a mining plan that should be updated as mining progresses and rehabilitation is being done</li> <li>6. Active seeding with an indigenous seed-mixture should take place during the rehabilitation phase.</li> <li>7. Subsoil and overburden in the Mining area should be stockpiled separately</li> <li>8. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles may further be protected by the construction of berms, trenches or low brick walls around their bases.</li> <li>9. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.</li> <li>10. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal</li> </ol>	Compliance with Duty of Care as detailed within NEMA	Duration of operations on the mine

			<p>route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage/leakage occurs should be attained and given to the project manager.</p> <p>11. The impact on the geology will be permanent. There is no mitigation measure.</p> <p>12. Establish an effective record keeping system for each area where soil is disturbed for Mining purposes. These records should be included in environmental performance reports and should include all the records below.</p> <ul style="list-style-type: none"> <li>• Record the GPS coordinates of each area.</li> <li>• Record the date of topsoil stripping.</li> <li>• Record the GPS coordinates of where the topsoil is stockpiled.</li> <li>• Record the date of cessation Mining activities at the particular site.</li> <li>• Photograph the area on cessation of Mining activities.</li> <li>• Record date and depth of re-spreading of topsoil.</li> <li>• Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</li> </ul>		
<p>Mining Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody</p> <p>– Blasting</p>	<p>Construction and operation phase</p>	<p>Application area: 304,8259 hectares</p>	<p>1. The Mining activities must aim to adhere to the relevant noise regulations in order to reduce disturbance of dwellings in close proximity to the development.</p> <p>2. Truck traffic should be routed away from noise sensitive areas, where possible.</p> <p>3. Noise levels must be kept within acceptable limits.</p> <p>4. Mine workers to wear necessary ear protection gear.</p> <p>5. Noisy activities to take place during allocated hours.</p> <p>6. Noise from labourers must be controlled.</p> <p>7. Noise suppression measures must be applied to all equipment. Equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from the site.</p> <p>8. The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the Contractor or his Sub-Contractors by the Contractors own transport.</p> <p>9. Applying regular and thorough maintenance schedules to equipment and processes. An increase in noise emission levels</p>	<p>Compliance with Duty of Care as detailed within NEMA</p>	<p>Duration of operations on the Mining area</p>

			<p>very often is a sign of the imminent mechanical failure of a machine.</p> <p>10. Proper and appropriate communication with neighbours about blasting, monitoring and actions done for proper control will be required.</p> <p>13. Comply with the Mine Health and Safety Act, 29 of 1996 Regulations. The duties/functions are imposed on/assigned to Bila Civil Contractors (Pty) Ltd.</p> <p>14. Changes to drill and blast design to mitigate ground vibration.</p> <p>15. Changes to charging designs to mitigate air blast and fly rock.</p> <p>16. Proper and appropriate communication with neighbours about blasting, monitoring and actions done for proper control will be required.</p> <p>17. Blast designs should be reviewed on a regular basis to ensure all blasting activities are within the legal and accepted standards.</p> <p>18. Safe blasting distance and evacuation is calculated at a minimum distance of 493 m.</p> <p>19. Stop and Go procedures during blasting will be required.</p> <p>20. Implement monitoring programme for recording blasting operations.</p> <p>21. Attempts should be made to keep to the recommended ground vibration air blast limits (Table 26 within the Blast Impact Assessment Report).</p> <p>22. Blasting should occur in favourable weather conditions as far as possible.</p> <ul style="list-style-type: none"> <li>o Do not blast too early in the morning when it is still cool or when there is a possibility of atmospheric inversion or too late in the afternoon in winter.</li> <li>o Do not blast in fog.</li> <li>o Do not blast in the dark</li> <li>o Refrain from blasting when wind is blowing strongly in the direction of an outside receptor.</li> <li>o Do not blast with low overcast clouds.</li> </ul> <p>23. Blasting notice boards must be sent up at various routes around the mining right area to inform the community of blasting dates and times.</p> <p>24. Monitoring could be done using permanent installed stations (consult Section 21, Figure 22 and Table 23 of the Blasting Impact Assessment report for suggested monitoring positions).</p> <p><b>Air blast and Fly rock:</b></p>		
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			<p>9. Increasing the stemming length ratio to blasthole diameter – either changing to a smaller diameter blasthole or increasing the actual stemming length.</p> <p>10. The use of aggregate stemming material of correct size ratio – 10 % of the blasthole diameter.</p> <p><b>Ground Vibration:</b></p> <p>11. Do blast design that considers the actual blasting, and the ground vibration levels to be adhered too.</p> <p>12. Change to bench heights with smaller diameter blastholes can be considered.</p> <p>13. Multiple charge decks in a blastholes initiated separately to reduce the charge mass per delay can be considered.</p> <p>14. Only apply electronic initiation systems to facilitate single hole firing.</p> <p>15. Do design for smaller diameter blast holes that will use fewer explosives per blast hole.</p> <p>16. Distance between blast and POI will have influence on the allowed charge mass per delay with regards to the different ground vibration limits, consult table 20 and table 21 in the Blast Impact Assessment specialist report.</p> <p><b>Underground workings:</b></p> <p>3) The charging and timing of blastholes should be recalculated not to exceed charge masses that will yield expected levels greater than 150 mm/s at the underground workings.</p> <p>4) A proper crown pillar distance between the underground workings and surface blasting must be confirmed – a rock engineer needs to make proper recommendation which must be implemented.</p>		
<p><u>Ecology of all watercourses associated with the proposed mining right area.</u></p> <p>Vegetation and topsoil clearing</p> <p>Construction of associated infrastructure such as access and haul roads</p> <p>Bulk material storage and handling</p>	<p>Construction Phase</p>		<ul style="list-style-type: none"> <li>• It is proposed that the southern tributary is diverted around active workings.</li> <li>• It is proposed that the extent of the open pit within the 100m buffer is realigned.</li> <li>• All riparian buffer areas must be avoided.</li> <li>• Areas where construction is to take place must be clearly demarcated. Any areas not demarcated must be completely avoided;</li> <li>• Stockpiling or storage of materials and/or waste must be placed beyond the defined buffers for each respective activity and clearly demarcated;</li> <li>• Tarps must be used to cover stockpiles when not in use;</li> </ul>	<p>Compliance with Duty of Care as detailed within NEMA</p>	<p>Duration of operations on the Mining area</p>

			<ul style="list-style-type: none"> <li>• Barriers and berms to capture runoff from both the construction areas as well as the topsoil stockpiles must be implemented;</li> <li>• No vehicles are to be serviced on open site, a suitable workshop with appropriate pollution control facilities should be utilised offsite;</li> <li>• Suitable stormwater and groundwater management, which will reduce erosion and sedimentation, must be established and implemented per pit. The implementation of said plans should be audited annually;</li> <li>• All fuels must be stored in a suitable storage device on an impermeable surface outside of the delineated buffer zones; and</li> <li>• All vehicle operators should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;</li> </ul>		
<p><u>Ecology of all watercourses associated with the proposed mining right area.</u></p> <p>Operation of open cast mine (blasting, pit formation, extraction, etc)</p> <p>Use of access and haul roads</p> <p>Use of large diesel equipment and vehicles</p> <p>River diversion</p>	<p>Operational Phase</p>		<ul style="list-style-type: none"> <li>• It is proposed that the southern tributary is diverted around active workings;</li> <li>• It is proposed that the extent of the open pit within the 100m buffer is realigned;</li> <li>• All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;</li> <li>• Drilling equipment shall be equipped with a closed cabin to reduce noise and dust exposure.</li> <li>• All riparian buffer zones must be avoided;</li> <li>• The implementation of concurrent rehabilitation with roll-over mining methods;</li> <li>• Alien vegetation removal in areas surrounding the open pit to be completed on a continuous basis;</li> <li>• Effective stormwater and management to divert water around the open pit areas;</li> <li>• No discharge of contaminated water to occur via open pit dewatering;</li> <li>• Appropriate Pollution Control Dams (PCD’s) should replace the current dirty water storage area in the current southern tributary;</li> <li>• Open pit dewatering efforts should occur in the form of dust suppression on haul roads;</li> <li>• The use of dust-suppression misting systems to mitigate dust emissions associated with the crushing and screening of mining ore;</li> </ul>	<p>Compliance with Duty of Care as detailed within NEMA</p>	<p>Duration of operations on the Mining area</p>

			<ul style="list-style-type: none"> <li>• If conveyors are used on site, they must be covered in order to minimise the effects of wind;</li> <li>• The use of appropriate stockpiles for overburden and waste rock must be implemented in designated areas;</li> <li>• Implementation of sedimentation and erosion control in drainage surrounding the open cast areas;</li> <li>• Consideration should be given to the use of erosion berms to prevent gully formation and siltation of the surrounding watercourses;</li> <li>• While avoidances is the preferred course of action, if mining must commence in the whole extent of Portion 2, a WULA must be conducted for the diversion of the southern tributary, around the mining operations;</li> <li>• A rehabilitation plan for the diverted southern tributary must be drafted for the Elandskraal Chromium Mine;</li> <li>• A groundwater assessment must be conducted to understand patterns of subsurface flow and its interaction with local watercourses to better predict potential risks;</li> <li>• A floodline determination should be conducted for the proposed mining activities in order to determine the extent of the 1:100 year flood of the southern tributary. This is to mitigate the flooding of pits and required for all PCD design specifications;</li> <li>• An annual adaptive water resource monitoring programme, whereby recommendations must be suitable implemented; and</li> <li>• Bi-annual aquatic biomonitoring studies.</li> </ul>		
<p><u>Ecology of all watercourses associated with the proposed mining right area.</u></p> <p>Clearing of associated infrastructure</p> <p>Rehabilitation of infrastructure footprint</p> <p>Mine drainage decant</p> <p>Alterations to subsurface flow</p>	<p>Closure &amp; Post Closure</p>		<ul style="list-style-type: none"> <li>• Backfill all pits with overburden;</li> <li>• The area must be contoured for a free draining landscape;</li> <li>• The southern tributary must be rehabilitated to a natural channel allowing for flow;</li> <li>• Erosion and sedimentation control must be in place within 1 month of completing the decommissioning phase for each pit;</li> <li>• Establish a treatment facility for the water in the PCD's where the TDS and TSS can precipitate out and clean water discharged back into the watercourse;</li> <li>• Complete avoidance of riparian buffer zones; and</li> <li>• Alien vegetation removal in areas surrounding the open pit areas, completed on a continuous basis.</li> <li>• Fertile topsoil must be brought into site for rehabilitation;</li> <li>• Erosion and sedimentation control must be in place and an annual survey should be completed until at-least complete vegetation rehabilitation (as determined by an appropriate specialist);</li> </ul>	<p>Compliance with Duty of Care as detailed within NEMA</p>	<p>Duration of operations on the Mining area</p>

		<ul style="list-style-type: none"> <li>• Alien invasive plant management plan must be in place; and</li> <li>• Groundwater modelling of potential</li> </ul>		
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**Specialist mitigation measures:**

**Terrestrial Biodiversity Impact Assessment (Appendix 11)**

Impacts	Mitigation measures:
Removal of indigenous vegetation	<ul style="list-style-type: none"> <li>• Rehabilitation: revegetate or stabilise all disturbed areas as soon as possible. Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions, while reseeding of exposed areas should be considered a high priority to allow a stable grass cover that prevent erosion.</li> <li>• The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust).</li> <li>• Conservation of topsoil should be prioritised on site and done as follows: <ul style="list-style-type: none"> <li>○ Topsoil should be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify;</li> <li>○ Topsoil stockpiles should preferably not exceed a height of 2 meters (maximum height of 5 meters where applicable) where possible. The topsoil outer layer should also be protected from wind erosion by the use of wind nets and soil binders. If topsoil needs to be stockpiled for longer than 12 months, seeding will improve long term stability and help to keep the soil in an active state. Keeping all the topsoil stockpiles at a height of 2 metres is however not feasible as it would create a large topsoil footprint area.</li> <li>○ Topsoil stockpile heights in excess of 5 meters and duration of storage until the end of the mining operations will likely destroy the bulk of propagates and most of the soil microbes. This can be countered by ensuring proper rehabilitation of the stockpile itself and additional augmentation of the rehabilitated areas where the stored topsoil will finally be placed. In order to reduce the risk of degrading the topsoil when placed in a single large topsoil stockpile and to prevent cross zoning of soils from different vegetation types, it is recommended that topsoil originating from different areas should be stored separately during the operational phase. Dust suppression would likely be a priority. It is recommended that topsoil from stockpiles in excess of 5 meters be used first for concurrent rehabilitation.</li> <li>○ Stockpile topsoil separately from subsoil;</li> <li>○ Stockpile in an area that is protected from storm water runoff and wind;</li> <li>○ Maintain topsoil stockpiles in a weed free condition;</li> <li>○ Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it;</li> <li>○ Stockpile topsoil for the minimum time period possible i.e. strip just before the relevant activity commences and replace as soon as it is completed.</li> </ul> </li> </ul>
Habitat destruction	<ul style="list-style-type: none"> <li>• Concurrent rehabilitation should occur during the operational phase on all exposed areas created by construction as well as roads, stockpiles and the overburden facility. Only indigenous species should be used for rehabilitation. The following programmes should be implemented as part of the operational phase of the mine: <ul style="list-style-type: none"> <li>○ Concurrent rehabilitation programme</li> <li>○ Alien invasive eradication programme</li> <li>○ Fire management programme</li> <li>○ Educational and training programme on conservation and ecological systems</li> </ul> </li> </ul>
Disturbance of fauna and fauna fatalities	<ul style="list-style-type: none"> <li>• Limit movement and mining activities to disturbed areas where possible.</li> <li>• Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction.</li> <li>• Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for bird of prey. Poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.</li> <li>• More fauna is normally killed the faster vehicles travel. A speed limit should be enforced as determined by the mine environmental manager. It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences).</li> <li>• Travelling at night should be avoided or limited as much as possible. No travelling at night should be allowed without approval by the mine manager.</li> <li>• Lights should be positioned 5m from the roads or paved areas.</li> </ul>

<p>Spread of alien and invader plant species</p>	<ul style="list-style-type: none"> <li>Control involves killing the alien invasive plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. The control of these species should even begin as soon as possible, considering that small populations of the invader plant species occur around the sites.</li> <li>Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to site or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase.</li> <li>Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.</li> <li>Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds.</li> <li>Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.</li> <li>A detailed plan should be developed for control of noxious weeds and invasive plants that could colonise the area as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.</li> </ul>
<p>Soil erosion and sedimentation</p>	<ul style="list-style-type: none"> <li>Sediment trapping, erosion and storm water control should be addressed by a hydrological engineer in a detailed storm water management plan.</li> <li>The overall macro-channel structures and mosaic of cobbles and gravels must be maintained by ensuring a balance (equilibrium) between sediment deposition and sediment conveyance maintained. A natural flooding and sedimentation regime must thus be ensured as far as reasonably possible.</li> <li>Steps must be taken to ensure that stormwater does not result in bank instability and excessive levels of silt entering the water course(s).</li> <li>Stormwater must be diverted from construction works, access roads, linear infrastructure and must be managed in such a manner as to disperse runoff and to prevent the concentration of stormwater flow.</li> <li>The velocity of stormwater discharges must be attenuated and the banks of the water courses protected.</li> <li>Cover disturbed soils as completely as possible, using vegetation or other materials.</li> <li>Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.</li> <li>Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.</li> <li>Structures must be non-erosive, structurally stable and must not induce any flooding or safety hazard.</li> <li>Structures must be inspected regularly for accumulation of debris, blockage, erosion of abutments and overflow areas - debris must be removed and damages must be repaired and reinforced immediately.</li> <li>Necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures and activities and to prevent in-stream sedimentation.</li> <li>Stockpiling of removed soil and sand must be stored outside of the 1:100 floodline and/or delineated riparian habitat and/or the regulated area of a water course, whichever is the greater, to prevent being washed into the channel and must be covered to prevent wind and rain erosion.</li> <li>Slope/bank stabilisation measures must be implemented with a 1:3 ratio or flatter and vegetated with indigenous vegetation immediately after the shaping.</li> <li>As much indigenous vegetation growth as possible should be promoted within the proposed development area in order to protect soil and to reduce the percentage of the surface area which is paved, hardened and/or compacted.</li> </ul>
<p>Pollution</p>	<ul style="list-style-type: none"> <li>Ensure that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries. Buffers should be implemented around the wetland and riparian zones.</li> <li>This risk of spillages of reagents and hydrocarbons on the soil during transportation can be reduced with proper maintenance of vehicles. This would include a rigorous and proactive maintenance program.</li> <li>This risk can be further reduced through an adequate program of training of drivers and crews. This would include defensive driver training, basic vehicle maintenance, and emergency control of spills. In order for the vehicle crews to be adequately able to control any spills at an early stage, the vehicles must be properly equipped with spill containment equipment (booms, sandbags, spades, absorbent pads, etc.). Responsibility for training lies with the transport contractor. Adequate training, maintenance, and equipment of transport crews should be included as a requirement for transport contracts.</li> <li>All employees will be trained in cleaning up of a spillage. The necessary spill kits containing the correct equipment to clean up spills will be made available at strategic points.</li> </ul>



- Pollution of and disposal/spillage of any material into the water course must be prevented, reduced, or otherwise remediated through proper operation, maintenance and effective protective measures.
- Vehicles and other machinery must be serviced well outside the 1:100 year floodline or delineated riparian habitat, whichever is the greatest.
- Oils and other potential pollutants must be disposed of at an appropriate licensed site, with the necessary agreement from the management of such a site.
- Vehicles must be checked for oil leaks and all maintenance must take place at a designated site further than 32 meters from the boundary of the water course(s).
- Any hazardous substances must be handled according to the relevant legislation relating to transport, storage and use of the substance and all storage facilities must be equipped with large, clearly readable material safety data sheets (MSDS).
- All reagent storage tanks and reaction units must be supplied with a bunded area built to contain sufficient capacity of the facility and provided with sumps and pumps to return the spilled material back into the system. The system must be maintained in a state of good repair and standby pumps must be provided.
- Silt, litter and hydrocarbon (oil) traps must be installed to minimise the risk of pollutants entering the natural drainage system of the area. A register must be in place to indicate that oils are recovered/recycled or alternatively disposed at a licensed facility.
- Activities (including spill clean-up) must start up-stream and proceed into a down-stream direction, so that the recovery processes can start immediately, without further disturbance from upstream works.
- Daily dampening of dust areas or other dust suppression methods such as dust-aside or more environmentally friendly methods.
- Re-vegetation of impacted areas is to be conducted on an on-going basis.
- Place dust generating activities where maximum protection can be obtained from natural features.
- Locating dust generating activities where prevailing winds will blow dust away from users.
- Minimize the need to transport and handle materials by placing adequate storage facilities close to processing areas.
- Minimize the re-handling of material which obviously has cost benefits as well.
- Exposed material should be protected from the wind by keeping it within voids or protecting it with topographical features where possible.
- Protect activities from wind by erecting a screen or using a natural barrier.
- All roads on site should be dampened or treated with a binding agent.
- The general vehicle speed should be restricted as there is a direct relationship between the speed and vehicle entrained emissions. Speed limit on site should be 40km/h and on National roads 80km/h
- Monitoring, modelling and emission measurements should be regarded as complementary components in any integrated approach to exposure assessment or determining compliance against air quality criteria.

## IMPACT MANAGEMENT OUTCOMES

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph

<b>ACTIVITY</b> (whether listed or not listed).  (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablation, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.).	<b>POTENTIAL IMPACT</b>  (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc....etc...)	<b>ASPECTS AFFECTED</b>	<b>PHASE</b> In which impact is anticipated  (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)	<b>MITIGATION TYPE</b>  (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)  E.g. <ul style="list-style-type: none"> <li>• <b>Modify through alternative method.</b></li> <li>• <b>Control through noise control</b></li> <li>• <b>Control through management and monitoring</b></li> <li>• <b>Remedy through rehabilitation..</b></li> </ul>	<b>STANDARD TO BE ACHIEVED</b>  (Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives) etc.
Clearance of vegetation	Loss or fragmentation of habitats	Fauna & flora	Construction & Operation	<p><b>Existing vegetation</b></p> <ol style="list-style-type: none"> <li>1. Vegetation removal must be limited to the Mining area.</li> <li>2. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step.</li> <li>3. No vegetation to be used for firewood.</li> <li>4. Exotic and invasive plant species should not be allowed to establish, if the development is approved.</li> </ol> <p><b>Rehabilitation</b></p> <ol style="list-style-type: none"> <li>1. As the opencast mining progresses, the voids created will be backfilled with overburden from the progressive opencast mining, and then overlain by the various soil horizons and rehabilitated;</li> <li>2. There will be a final void at the end of life of mine and this will be filled with overburden material;</li> <li>3. The area will be blended in with the surrounding landscape and allowed to be free draining;</li> <li>4. Once the void has been backfilled, 300mm thick topsoil or soft overburden in place of soil will be spread on rehabilitated areas; and</li> </ol>	Minimisation of impacts to acceptable limits

				<p>5. Once placed, the “growth medium” should then be fertilised, ripped and re-vegetated. A small topsoil stockpile should be left for remedial work.</p> <p><b>Demarcation of Mining area</b></p> <p>6. All plants not interfering with Mining operations shall be left undisturbed clearly marked and indicated on the site plan.</p> <p>7. The Mining area must be well demarcated and no construction/Mining activities must be allowed outside of this demarcated footprint.</p> <p>8. Vegetation removal must be phased in order to reduce impact of construction/Mining.</p> <p>9. Site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.</p> <p>10. Strict and regular auditing of the Mining process to ensure containment of the Mining and laydown areas.</p> <p>11. Soils must be kept free of petrochemical solutions that may be kept on site during construction/Mining. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.</p> <p><b>Utilisation of resources</b></p> <p>12. Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.</p> <p><b>Exotic vegetation</b></p> <p>13. Alien vegetation on the site will need to be controlled.</p> <p>14. The Contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion.</p> <p>15. The spread of exotic species occurring throughout the site should be controlled.</p> <p><b>Herbicides</b></p> <p>16. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision</p>	
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				<p>of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.</p> <p>17. The use of pesticides and herbicides on the site must be discouraged as these impact on important pollinator species of indigenous vegetation.</p> <p><b>Fauna</b></p> <p>18. Rehabilitation to be undertaken as soon as possible after the Mining activities have been completed.</p> <p>19. No trapping or snaring to fauna on the construction/Mining site should be allowed.</p> <p>20. No faunal species must be disturbed, trapped, hunted or killed by maintenance staff during any routine maintenance at the development.</p>	
<p>Mining Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody</p> <p>– excavations</p>	Loss of topsoil	Soil	(Construction and operation phase)	<ol style="list-style-type: none"> <li>1. The Contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas.</li> <li>2. Care must be taken not to mix topsoil and subsoil during stripping.</li> <li>3. The topsoil must be conserved on site in and around the pit/trench area.</li> <li>4. All topsoil must be stockpiled and eventually replaced in an orderly manner during rehabilitation phase.</li> <li>5. Mining which includes the initial removal of the topsoil should be done in a phased manner in areas earmarked for definite opencast mining activities in accordance to a mining plan that should be updated as mining progresses and rehabilitation is being done</li> <li>6. Active seeding with an indigenous seed-mixture should take place during the rehabilitation phase.</li> <li>7. Subsoil and overburden in the Mining area should be stockpiled separately to be returned for backfilling in the correct soil horizon order.</li> </ol>	Minimisation of impacts to acceptable limits

				<p>8. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.</p> <p>9. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.</p> <p>10. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage/leakage occurs should be attained and given to the project manager.</p> <p>11. Establish an effective record keeping system for each area where soil is disturbed for Mining purposes. These records should be included in environmental performance reports and should include all the records below.</p> <ul style="list-style-type: none"> <li>• Record the GPS coordinates of each area.</li> <li>• Record the date of topsoil stripping.</li> <li>• Record the GPS coordinates of where the topsoil is stockpiled.</li> <li>• Record the date of cessation Mining activities at the particular site.</li> <li>• Photograph the area on cessation of Mining activities.</li> <li>• Record date and depth of re-spreading of topsoil.</li> <li>• Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</li> </ul>	
	Erosion	Soil Air Water	(Construction and operation phase)	<p>1. An effective system of run-off control should be implemented, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.</p> <p>2. Periodical site inspection should be included in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records the occurrence of any erosion on site or downstream.</p>	Minimisation of impacts to acceptable limits

				<ol style="list-style-type: none"> <li>3. Wind screening and stormwater control should be undertaken to prevent soil loss from the site.</li> <li>4. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion.</li> <li>5. Other erosion control measures that can be implemented are as follows:             <ul style="list-style-type: none"> <li>○ Brush packing with cleared vegetation</li> <li>○ Mulch or chip packing</li> <li>○ Planting of vegetation</li> <li>○ Hydroseeding/hand sowing</li> </ul> </li> <li>6. All erosion control mechanisms need to be regularly maintained.</li> <li>7. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces.</li> <li>8. Retention of vegetation where possible to avoid soil erosion.</li> <li>9. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.</li> <li>10. Re-vegetation of disturbed surfaces should occur immediately after construction/Mining activities are completed. This should be done through seeding with indigenous grasses.</li> <li>11. No impediment to the natural water flow other than approved erosion control works is permitted.</li> <li>12. To prevent stormwater damage, the increase in stormwater run-off resulting from construction/Mining activities must be estimated and the drainage system assessed accordingly.</li> </ol>	
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	Air Pollution	Air Pollution	Construction and operation phase)	<p><b>Dust control actions</b></p> <ol style="list-style-type: none"> <li>1. A complaints register should be kept on site. All complaints should be logged in the complaints register and should be available on the site at all times.</li> <li>2. All complaints regarding air quality should be adequately investigated and actions taken to reduce the impact in a timely manner should it be required.</li> <li>3. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary.</li> <li>4. Implement and maintain a Dust and Emission Management Plan which provides clear details on preventing, maintaining, and improving the air quality in terms of site-specific activities.</li> <li>5. Should dust emission become a problem, a monthly dust fallout monitoring programme must be implemented.</li> <li>6. Note must be taken of incidents that cause air emissions and this must be recorded to ensure that these are resolved and prevented from reoccurring.</li> <li>7. Weekly site inspections should be undertaken in the vicinity of sensitive receptors. Records should be kept of these routine inspections.</li> <li>8. Plan the site layout in such a manner as to ensure that emission generating activities occur as far as possible from sensitive receptors.</li> <li>9. Ensure that all vehicles are maintained in good working condition and that they are serviced on a regular basis.</li> <li>10. Ensure that all vehicles are switched off when stationary – no vehicles should be idling for extended period.</li> <li>11. Impose and regulate a speed limit of 30 km/h on the site at all times.</li> <li>12. Provide speed-reduction structures positioned in the dirt access road to ensure maximum effectiveness at slowing down vehicles utilising this road.</li> <li>13. Speed humps will need to be in place in order to assist in restricting truck drives from speeding</li> <li>14. A water car must be maintained and kept in good working order at all times. It is important for the water</li> </ol>	Minimisation of impacts to acceptable limits
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				<p>car to maintain a schedule for rounds to keep the roads damp and so assist in dust suppression.</p> <ol style="list-style-type: none"><li>15. Water sprays to be applied at the area to be cleared should significant amounts of dust be generated.</li><li>16. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover, seed or fence stockpiles to prevent wind whipping.</li><li>17. Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles.</li><li>18. Ensure travel distance between clearing area and topsoil piles to be at a minimum.</li><li>19. Only remove the cover in small areas during work and not all at once.</li><li>20. Ensure exposed areas remain moist through regular water spraying during dry, windy periods.</li><li>21. Reshape all disturbed areas to their natural contours.</li><li>22. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.</li></ol> <p>Avoid bonfires and burning of waste materials</p>	
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	Air Pollution	Dust Control	Construction and operation phase)	<p><b>Limit Cleared Areas</b></p> <ol style="list-style-type: none"> <li>1) Avoid clearing the entire site at once, instead clear areas as required in stages of the operation.</li> <li>2) In other areas, maintain the original vegetation cover for as long as possible;</li> <li>3) Before any site works commence, plan and locate the vegetation cover that needs to be retained;</li> <li>4) Protect this vegetation by fencing or blocking off from the rest of the site operations;</li> </ol> <p><b>Vegetative Stabilisation</b></p> <ol style="list-style-type: none"> <li>5) Retain as much existing vegetation as possible;</li> <li>6) If an area needs to be cleared, transplant established plants that must be disturbed to areas that need vegetation;</li> <li>7) If existing vegetation must be removed and cannot be immediately transplanted elsewhere, remove and maintain them for replanting at project completion. If trees and plants must be removed and it is not possible for them to be replanted, consider chipping and using the material as mulch – the advantage is that reseedling of original vegetation can occur. Where possible, restore vegetation that is native to the area to maximise plant success and improve environmental conditions.</li> </ol> <p><b>Timing of the Development</b></p> <ol style="list-style-type: none"> <li>8) Activities with high dust-causing potential, such as topsoil stripping, should not be carried out in sensitive areas during adverse wind conditions. When necessary, topsoil should be stripped in discrete sections, allowing buffer strips (windbreaks) between clearings.</li> </ol> <p><b>Wind Barriers</b></p> <p>Wind barriers should be placed on site before commencement of works and when it is apparent that one is required during the phase of the operation. Consider the following options when placing barriers to prevent dust emissions:</p> <ol style="list-style-type: none"> <li>9) Wind barriers are most effective when placed perpendicular to the direction of the prevailing wind,</li> </ol>	Minimisation of impacts to acceptable limits
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				<p>but will have little or no effect when the wind direction is parallel to the fence;</p> <p>10) When choosing wind barriers, it has been observed that solid barriers provide significant reductions in wind velocity for relatively short leeward distances, whereas porous barriers provide smaller reductions in velocity for more extended distances;</p> <p>11) Wind barriers should be at least 2 metres high;</p> <p>12) The screening material should have a porosity of 50% or less.</p> <p><b>Earth Moving Management</b></p> <p>13) Plan earth-moving works so that they are completed just prior to the time they are needed;</p> <p>14) Observe weather conditions and do not commence or continue earth moving works if conditions are unsuitable e.g., under conditions of strong winds;</p> <p>15) Reduce offsite hauling via balanced cut and fill operations;</p> <p>Pre-water areas to be disturbed.</p>	
	<p>Fugitive Dust – dustfall, PM10 &amp; PM2.5</p> <p>Material handling operations; exposed areas, stockpiles/dumps, mining activity (excavators, FELs, etc.); truck loading and offloading operations; crushing and screening; drilling, blasting, bulldozing, and material transfer points.</p>	<p>Fugitive Dust – dustfall, PM10 &amp; PM2.5</p>	<p>Construction and operation phase)</p>	<p>1) Reduce height of material transfer at the crushing plant (e.g. miscellaneous transfer points).</p> <p>2) Water sprays for material handling operations (e.g. wet material while offloading trucks).</p> <p>3) Water sprays for drilling, blasting and bulldozing activities.</p> <p>4) Water sprays for stockpiles and material storage areas.</p> <p>5) Wind breaks at material storage areas that are prone to dust emissions.</p> <p>6) Use of vegetation, topsoil and/or rock armour on large stockpiles and dumps that are prone to wind erosion.</p> <p>7) Partial or full enclosure of material transfer points, where applicable.</p> <p>8) Regular maintenance of crushing and processing plant equipment, including dust suppression equipment, to ensure the equipment is operating properly.</p> <p>9) Immediate clean-up of any material (i.e. ROM, waste rock/overburden and topsoil) spillages.</p> <p>10) Conduct regular site inspections to ensure the dust mitigation measures are being implemented. Regular</p>	<p>Minimisation of impacts to acceptable limits</p>

				<p>visual site inspections are recommended to assess whether further mitigation is required for any of the dust emission sources.</p> <p>11) A dust management plan will need to be developed for onsite activities.</p> <ul style="list-style-type: none"> <li>Dust control measures need to be assessed in detail and incorporated into the plan.</li> </ul> <p>The plan should include appropriate mitigation measures as described in: Table 6-1 of the AQIA for all key dust emission sources during the operational phase.</p>	
<p>Fugitive Dust – dustfall, PM10 &amp; PM2.5 &amp; Gases</p> <p>Vehicle dust entrainment, truck exhaust emissions and any other mining vehicle/equipment exhaust emissions</p>	<p>Fugitive Dust – dustfall, PM10 &amp; PM2.5 &amp; Gases</p>	<p>Construction and operation phase)</p>	<ol style="list-style-type: none"> <li>Have clearly defined hauling routes/vehicle access areas. These areas should preferably be paved (e.g. using surface coating such as bitumen), where possible or treated for dust suppression.</li> <li>All main hauling roads should be treated for dust suppression (water spraying and chemical dust suppressants).</li> <li>Conduct regular cleaning/sweeping of paved road surfaces to prevent the accumulation of dust.</li> <li>Conduct regular maintenance and checks for haul road surfaces.</li> <li>Immediate clean-up of any spillage.</li> <li>All material that is being transported should be covered during transport (where possible).</li> <li>Control the number of trucks on the road, weight of trucks and the travelling speed. Implement strict vehicle speed limits (e.g. 20-40 km/h).</li> <li>Switch off engines whilst not in use;</li> <li>Establish a maintenance schedule to ensure proper maintenance of the trucks &amp; mobile equipment;</li> </ol> <p>Conduct regular maintenance and quality checks (engines/tyres) for all heavy mobile equipment/trucks.</p>	<p>Minimisation of impacts to acceptable limits</p>	
<p>Noise</p>		<p>(Construction and operation phase)</p>	<ol style="list-style-type: none"> <li>The Mining activities must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of dwellings in close proximity to the development.</li> <li>Noise levels must be kept within acceptable limits.</li> <li>Noisy operations should be combined so that they occur where possible at the same time.</li> <li>Mine workers to wear necessary ear protection gear.</li> <li>Noisy activities to take place during allocated hours.</li> <li>Noise from labourers must be controlled.</li> </ol>	<p>Minimisation of impacts to acceptable limits</p>	

				7. Noise suppression measures must be applied to all equipment. Equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or	
	Impact on potential cultural and heritage artefacts	Heritage	(Construction and operation phase)	<ol style="list-style-type: none"> <li>1) Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DEA.</li> <li>2) Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts/ fossils are uncovered in the affected area.</li> <li>3) The Contractor must ensure that his workforce is aware of the necessity of reporting any possible historical, archaeological or palaeontological finds to the ECO so that appropriate action can be taken.</li> <li>4) Known sites should be clearly marked in order that they can be avoided. The work force should also be informed that fenced-off areas are no-go areas.</li> <li>5) The ECO must also survey for heritage and palaeontological artefacts during ground breaking and digging or drilling. He/she should familiarise themselves with formations and its fossils or a palaeontologist should be appointed during the digging and excavation phase of the development.</li> <li>6) All digging, excavating, drilling or blasting activities must be stopped if heritage and/or palaeontological artefacts are uncovered and a specialist should be called in to determine proper management, mitigation, excavation and/or collecting measures.</li> <li>7) Any discovered artefacts or fossils shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from SAHRA should the proposed site affect any world heritage/palaeontology sites or if any heritage/palaeontology sites are to be destroyed or altered.</li> <li>8) Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or</li> </ol>	Minimisation of impacts to acceptable limits

				<p>palaeontological artefacts, as set out in the NHRA (Act No. 25 of 1999), Section 51. (1).</p> <p>9) According to the HIA there is a large cemetery on the proposed area (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E). A 20m buffer zone must be placed around the graveyard in order to avoid potential damage during mining activities</p> <p>10) Cultural Heritage in South Africa (includes all heritage resources) is protected by the <b>National Heritage Resources Act (Act 25 of 1999) (NHRA)</b>. According to Section 3 of the Act, all Heritage resources include <b>“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”</b>.</p> <p>If such resources are found during the mining or development activities, they shall not be disturbed without a permit from the relevant heritage resource Authority, which means that before such sites are disturbed by development it is incumbent on the developer to ensure that a heritage impact assessment is done and the Provincial Heritage Resources Authority and SAHRA must be contacted immediately and work must stop.</p> <p>If anything of Archaeological and/or paleontological significance is found during the construction and operational phase of the mine the following applies:</p> <ul style="list-style-type: none"> <li>• NHRA 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</li> <li>• NHRA 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (012 320 8490), must be alerted</li> </ul>	
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				<p>immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</p> <ul style="list-style-type: none"> <li>• NHRA 38(4)e – The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;</li> </ul> <p>If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the <b>Chance Find Protocol</b> must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.</p> <p><b>Chance Find Procedure</b></p> <ul style="list-style-type: none"> <li>• If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find.</li> <li>• The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web:</li> </ul>	
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				<p>www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.</p> <ul style="list-style-type: none"> <li>• A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.</li> <li>• Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.</li> </ul> <p>Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.</p> <ul style="list-style-type: none"> <li>• The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.</li> <li>• In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.</li> <li>• Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.</li> </ul> <p><b>Phase 1 Heritage Impact Assessment (Appendix 11)</b> graveyard must be included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a</p>	
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				20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities.	
Waste management		Pollution	(Construction and operation phase)	<p><b>Litter management</b></p> <ol style="list-style-type: none"> <li>1. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site.</li> <li>2. The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at registered/licensed landfill.</li> <li>3. Good housekeeping practices should be implemented to regularly maintain the litter and rubble situation on the construction site.</li> <li>4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent contractor can be appointed to conduct this recycling.</li> <li>5. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite.</li> <li>6. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly.</li> <li>7. All waste must be removed from the site and transported to a landfill site promptly to ensure that it does not attract vermin or produce odours.</li> <li>8. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.</li> <li>9. A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant.</li> <li>10. Under no circumstances may solid waste be burnt on site.</li> <li>11. All waste must be removed promptly to ensure that it does not attract vermin or produce odours.</li> </ol> <p><b>Hazardous waste</b></p> <ol style="list-style-type: none"> <li>12. All waste hazardous materials must be carefully stored as advised by the ECO, and then disposed of offsite at a licensed landfill site, where practical. Incineration may be used where relevant.</li> </ol>	Minimisation of impacts to acceptable limits



				<p>13. Contaminants to be stored safely to avoid spillage.</p> <p>14. Machinery must be properly maintained to keep oil leaks in check.</p> <p>15. All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills shall immediately be cleaned up and all affected areas rehabilitated.</p> <p><b>Sanitation</b></p> <p>16. The Contractor shall install mobile chemical toilets on the site.</p> <p>17. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed.</p> <p>18. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly.</p> <p>19. Toilets should be no closer than 50m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the Engineer.</p> <p>20. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility.</p> <p>21. The construction of “Long Drop” toilets is forbidden, but rather toilets connected to the sewage treatment plant.</p> <p>22. Potable water must be provided for all construction staff.</p> <p><b>Remedial actions</b></p> <p>23. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site.</p> <p>24. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site.</p> <p>25. The ECO must determine the precise method of treatment for polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil.</p>	
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				<p>26. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material.</p> <p>27. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure.</p> <p>28. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.</p> <p>29. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.</p>	
Water Use and Quality	Water pollution	Water	(Construction and operation phase)	<p><b>Water Use</b></p> <ol style="list-style-type: none"> <li>1. Develop a sustainable water supply management plan to minimise the impact to natural systems by managing water use, avoiding depletion of aquifers and minimising impacts to water users.</li> <li>2. Water must be reused, recycled or treated where possible.</li> </ol> <p><b>Government Notice Regulation 704 of 1999</b></p> <ol style="list-style-type: none"> <li>1. GNR.704 of 1999 under the NWA provides regulations on the use of water for mining and related activities aimed at the protection of water resources (requirements for clean and dirty water separation). GNR.704 requires inter alia the following: <ul style="list-style-type: none"> <li>• Separation of clean (unpolluted) water from dirty water;</li> <li>• Collection and confinement of the water arising within any dirty area into a dirty water system;</li> <li>• Design, construction, maintenance and operation of the clean water and dirty water management systems so that it is not likely for either system to spill into the other more than once in 50 years;</li> </ul> </li> </ol> <p><b>Stormwater</b></p> <ol style="list-style-type: none"> <li>1. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater,</li> </ol>	

				<p>due to suspended solids and silt or chemical pollutants.</p> <ol style="list-style-type: none"> <li>2. Silt fences should be used to prevent any soil entering the stormwater drains.</li> <li>3. Temporary cut off drains and berms may be required to capture stormwater and promote infiltration.</li> <li>4. Promote a water saving mind set with construction/Mining workers in order to Contractor ensure less water wastage.</li> <li>5. Hazardous substances must be stored at least 40m from any water bodies on site to avoid pollution.</li> <li>6. The installation of the stormwater system must take place as soon as possible to attenuate stormwater from the construction phase as well as the operation phase.</li> <li>7. Earth, stone and rubble is to be properly disposed of, or utilized on site so as not to obstruct natural water path ways over the site. i.e. these materials must not be placed in stormwater channels, drainage lines or rivers.</li> <li>8. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed.</li> <li>9. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas.</li> </ol> <p>The cut-off trenches and silt fences will be installed where necessary as to control runoff storm water by attenuating it and control the movement of sediment on the premises.</p> <p>These structures will be monitored on a regular basis. It is suggested that it be monitored on a weekly basis during the rainy season, and after possible rain events during the dry season.</p> <p>If these practices is found to be insufficient for the control of storm water and sedimentation, other alternatives should immediately be investigated and implemented.</p>	
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				<p><b>Groundwater resource protection</b></p> <ol style="list-style-type: none"> <li>1. Process solution storage ponds and other impoundments designed to hold non fresh water or non-treated process effluents should be lined and be equipped with sufficient wells to enable monitoring of water levels and quality.</li> </ol> <p><b>Sanitation</b></p> <ol style="list-style-type: none"> <li>1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers).</li> <li>2. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.</li> </ol> <p><b>Concrete mixing</b></p> <ol style="list-style-type: none"> <li>1. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth.</li> </ol> <p><b>Public areas</b></p> <ol style="list-style-type: none"> <li>1. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis.</li> <li>2. The Contractor should take steps to ensure that littering by construction/Mining workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines.</li> </ol>	
Water Use and Quality	Changes to the hydrological regime of the stream		(Construction and operation phase)	<p><b>Water Quality</b></p> <ol style="list-style-type: none"> <li>1. The quality and quantity of effluent streams discharged to the environment including stormwater should be managed and treated to meet applicable effluent discharge guidelines.</li> <li>2. Discharge to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria outside a scientifically established mixing zone.</li> <li>3. Efficient oil and grease traps or sumps should be installed and maintained at refueling facilities, workshops, fuel storage depots, and containment</li> </ol>	

				<p>areas and spill kits should be available with emergency response plans.</p> <p>4. Bi-annual aquatic biomonitoring assessments in order to monitor the effects of the mining of aquatic life within the catchment.</p>	
	Impact of changes to water quality		(Construction and operation phase)	<p><b>Mitigation</b></p> <ul style="list-style-type: none"> <li>• Continue with the groundwater quality and groundwater level monitoring for a period of two to four years after mining ceases in order to establish post-closure groundwater level and quality trends.</li> <li>• The monitoring information must be used to update, verify and recalibrate the predictive tools used during the study to increase the confidence in the closure objectives and management plans.</li> <li>• Use the results of the monitoring programme to confirm/validate the predicted impacts on groundwater availability and quality after closure;</li> <li>• Update existing predictive tools to verify long-term impacts on groundwater, if required;</li> <li>• The post closure contaminant potential should be determined during the operational phase;</li> <li>• The DWA Mine Closure Best Practice Guidelines should be adhered to where relevant;</li> <li>• Pollution control dam could be used to intercept polluted seepage water. This should be considered if it is found. Regular sampling of the surface water/pit water is essential;</li> <li>• Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine; and</li> <li>• Audit the monitoring network annually.</li> </ul>	
	Loss of riparian vegetation, aquatic habitat and stream continuity (migration corridors)		(Construction and operation phase)	<p><b>Proposed mitigation</b></p> <ul style="list-style-type: none"> <li>• As far as possible, all rehabilitation activities should occur in the low flow season, during the drier winter months.</li> <li>• Rehabilitation must ensure that riparian structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger riparian systems at pre-mining levels.</li> </ul>	

				<ul style="list-style-type: none"> <li>• Stabilisation of banks by employing one of the individual techniques below or a combination thereof, is essential, given the inherent susceptibility of the soils to erosion. Such measures include:             <ul style="list-style-type: none"> <li>○ Re-sloping of banks to a maximum of a 1:3 slope;</li> <li>○ Revegetation of re-profiled slopes;</li> <li>○ Temporary stabilisation of slopes using geotextiles; and</li> <li>○ Installation of gabions and reno-mattresses.</li> <li>○ To prevent the further erosion of soils, management measures may include berms, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible to erosion</li> </ul> </li> </ul>	
	<p>Spread of alien invasive species</p>		<p>(Construction and operation phase)</p>	<ul style="list-style-type: none"> <li>• All soils compacted as a result of construction activities falling outside of project areas should be ripped and profiled.</li> <li>• Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat;</li> <li>• As far as possible, all rehabilitation activities should occur in the low flow season, during the drier winter months.</li> <li>• Trenches and deep excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are exposed should contain soil ramps allowing fauna to escape the trench</li> <li>• <b>Proposed mitigation</b></li> <li>• Proliferation of alien and invasive species is expected within any disturbed areas particularly as there are some alien and invasive species within the study area at present. These species should be eradicated and controlled to prevent further spread beyond the study area;</li> <li>• It is suggested that an alien plant removal program be initialised within the study area in order to help</li> </ul>	

				<p>reinstate more natural hydrological and ecological functions to within the project site;</p> <ul style="list-style-type: none"> <li>• Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;</li> <li>• Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;</li> <li>• Footprint areas should be kept as small as possible when removing alien plant species;</li> <li>• No vehicles should be allowed to drive through designated sensitive drainage lines and riparian areas during the eradication of alien and weed species.</li> <li>• All alien vegetation in the riparian zone should be removed upon completion of mining activities and reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist)</li> </ul>	
	Groundwater quality		(Construction and operation phase)	<p><b>Groundwater quality</b></p> <ol style="list-style-type: none"> <li>1. At least two groundwater monitoring boreholes must be drilled at the location indicated in Figure 8 of the Geohydrological Report (Appendix 11). <ul style="list-style-type: none"> <li>• The downstream borehole will monitor any possible groundwater contamination into neighbouring streams &amp; tributaries</li> <li>• The upstream borehole is considered a control borehole located further away from Mine activities</li> </ul> </li> <li>2. Conduct groundwater level monitoring on a weekly basis (Depending on the guidelines of the regulating authority)</li> <li>3. Macro chemical analysis within the mining right area, must be conducted after every three months or on a bi-annual basis.</li> </ol>	
Waste generation	Pollution due to oil and fuel spills, erosion, and ablution facilities.		(Construction and operation phase)	<ul style="list-style-type: none"> <li>• Proper ablution facilities on site must be provided.</li> <li>• Constant rehabilitation of erosion problems.</li> <li>• Proper storage facilities of construction materials.</li> <li>• Waste management is very important. Proper storage and removal strategy must be in place.</li> <li>• Proper Standard Operating Procedures in place regulating refuelling and other potential polluting activities.</li> </ul>	

				<ul style="list-style-type: none"> <li>• Must have rehabilitation strategy as part of EMP such as a clean-up plan/strategy if spills occur and proper facilities (ablution) to ensure no sewerage spills into drainage lines and streams.</li> </ul>	
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**Specialist mitigation measures:**  
Riverine Baseline Study (Appendix 11)

Ecology of all watercourses associated with the proposed mining right area.

Impacts	Mitigation measures:
<p><u>Construction phase</u></p> <p>Vegetation and topsoil clearing</p> <p>Construction of associated infrastructure such as access and haul roads</p> <p>Bulk material storage and handling</p>	<ul style="list-style-type: none"> <li>• It is proposed that the southern tributary is diverted around active workings.</li> <li>• It is proposed that the extent of the open pit within the 100m buffer is realigned.</li> <li>• All riparian buffer areas must be avoided.</li> <li>• Areas where construction is to take place must be clearly demarcated. Any areas not demarcated must be completely avoided;</li> <li>• Stockpiling or storage of materials and/or waste must be placed beyond the defined buffers for each respective activity and clearly demarcated;</li> <li>• Tarps must be used to cover stockpiles when not in use;</li> <li>• Barriers and berms to capture runoff from both the construction areas as well as the topsoil stockpiles must be implemented;</li> <li>• No vehicles are to be serviced on open site, a suitable workshop with appropriate pollution control facilities should be utilised offsite;</li> <li>• Suitable stormwater and groundwater management, which will reduce erosion and sedimentation, must be established and implemented per pit. The implementation of said plans should be audited annually;</li> <li>• All fuels must be stored in a suitable storage device on an impermeable surface outside of the delineated buffer zones; and</li> <li>• All vehicle operators should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;</li> </ul>
<p><u>Operational Phase</u></p> <p>Operation of open cast mine (blasting, pit formation, extraction, etc)</p> <p>Use of access and haul roads</p> <p>Use of large diesel equipment and vehicles</p> <p>River diversion</p>	<ul style="list-style-type: none"> <li>• It is proposed that the southern tributary is diverted around active workings;</li> <li>• It is proposed that the extent of the open pit within the 100m buffer is realigned;</li> <li>• All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";</li> <li>• Drilling equipment shall be equipped with a closed cabin to reduce noise and dust exposure.</li> <li>• All riparian buffer zones must be avoided;</li> <li>• The implementation of concurrent rehabilitation with roll-over mining methods;</li> <li>• Alien vegetation removal in areas surrounding the open pit to be completed on a continuous basis;</li> <li>• Effective stormwater and management to divert water around the open pit areas;</li> <li>• No discharge of contaminated water to occur via open pit dewatering;</li> <li>• Appropriate Pollution Control Dams (PCD's) should replace the current dirty water storage area in the current southern tributary;</li> <li>• Open pit dewatering efforts should occur in the form of dust suppression on haul roads;</li> <li>• The use of dust-suppression misting systems to mitigate dust emissions associated with the crushing and screening of mining ore;</li> <li>• If conveyors are used on site, they must be covered in order to minimise the effects of wind;</li> <li>• The use of appropriate stockpiles for overburden and waste rock must be implemented in designated areas;</li> <li>• Implementation of sedimentation and erosion control in drainage surrounding the open cast areas;</li> <li>• Consideration should be given to the use of erosion berms to prevent gully formation and siltation of the surrounding watercourses;</li> </ul>



	<ul style="list-style-type: none"> <li>While avoidances is the preferred course of action, if mining must commence in the whole extent of Portion 2, a WULA must be conducted for the diversion of the southern tributary, around the mining operations;</li> <li>A rehabilitation plan for the diverted southern tributary must be drafted for the Elandskraal Chromium Mine;</li> <li>A groundwater assessment must be conducted to understand patterns of subsurface flow and its interaction with local watercourses to better predict potential risks;</li> <li>A floodline determination should be conducted for the proposed mining activities in order to determine the extent of the 1:100 year flood of the southern tributary. This is to mitigate the flooding of pits and required for all PCD design specifications;</li> <li>An annual adaptive water resource monitoring programme, whereby recommendations must be suitable implemented; and</li> </ul> <p>Bi-annual aquatic biomonitoring studies.</p>
<p><u>Decommissioning (Closure &amp; Post Closure) Phase</u></p> <p>Clearing of associated infrastructure</p> <p>Rehabilitation of infrastructure footprint</p> <p>Mine drainage decant</p> <p>Alterations to subsurface flow</p>	<ul style="list-style-type: none"> <li>Backfill all pits with overburden;</li> <li>The area must be contoured for a free draining landscape;</li> <li>The southern tributary must be rehabilitated to a natural channel allowing for flow;</li> <li>Erosion and sedimentation control must be in place within 1 month of completing the decommissioning phase for each pit;</li> <li>Establish a treatment facility for the water in the PCD's where the TDS and TSS can precipitate out and clean water discharged back into the watercourse;</li> <li>Complete avoidance of riparian buffer zones; and</li> <li>Alien vegetation removal in areas surrounding the open pit areas, completed on a continuous basis.</li> <li>Fertile topsoil must be brought into site for rehabilitation;</li> <li>Erosion and sedimentation control must be in place and an annual survey should be completed until at-least complete vegetation rehabilitation (as determined by an appropriate specialist);</li> <li>Alien invasive plant management plan must be in place; and</li> <li>Groundwater modelling of potential</li> </ul>

**Specialist mitigation measures:**

Terrestrial Biodiversity Impact Assessment (**Appendix 11**)

Impacts	Mitigation measures:
Removal of indigenous vegetation	<ul style="list-style-type: none"> <li>Rehabilitation: revegetate or stabilise all disturbed areas as soon as possible. Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions, while reseeding of exposed areas should be considered a high priority to allow a stable grass cover that prevent erosion.</li> <li>The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust).</li> <li>Conservation of topsoil should be prioritised on site and done as follows:             <ul style="list-style-type: none"> <li>Topsoil should be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify;</li> <li>Topsoil stockpiles should preferably not exceed a height of 2 meters (maximum height of 5 meters where applicable) where possible. The topsoil outer layer should also be protected from wind erosion by the use of wind nets and soil binders. If topsoil needs to be stockpiled for longer than 12 months, seeding will improve long term stability and help to keep the soil in an active state. Keeping all the topsoil stockpiles at a height of 2 metres is however not feasible as it would create a large topsoil footprint area.</li> <li>Topsoil stockpile heights in excess of 5 meters and duration of storage until the end of the mining operations will likely destroy the bulk of propagates and most of the soil microbes. This can be countered by ensuring proper rehabilitation of the stockpile itself and additional augmentation of the rehabilitated areas where the stored topsoil will finally be placed. In order to reduce the risk of degrading the topsoil when placed in a single large topsoil stockpile and to prevent cross zoning of soils from different vegetation types, it is recommended that topsoil originating from different areas should be stored separately during the operational phase. Dust suppression would likely be a priority. It is recommended that topsoil from stockpiles in excess of 5 meters be used first for concurrent rehabilitation.</li> <li>Stockpile topsoil separately from subsoil;</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Stockpile in an area that is protected from storm water runoff and wind;</li> <li>○ Maintain topsoil stockpiles in a weed free condition;</li> <li>○ Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it;</li> <li>○ Stockpile topsoil for the minimum time period possible i.e. strip just before the relevant activity commences and replace as soon as it is completed.</li> </ul>
Habitat destruction	<ul style="list-style-type: none"> <li>● Concurrent rehabilitation should occur during the operational phase on all exposed areas created by construction as well as roads, stockpiles and the overburden facility. Only indigenous species should be used for rehabilitation. The following programmes should be implemented as part of the operational phase of the mine: <ul style="list-style-type: none"> <li>○ Concurrent rehabilitation programme</li> <li>○ Alien invasive eradication programme</li> <li>○ Fire management programme</li> <li>○ Educational and training programme on conservation and ecological systems</li> </ul> </li> </ul>
Disturbance of fauna and fauna fatalities	<ul style="list-style-type: none"> <li>● Limit movement and mining activities to disturbed areas where possible.</li> <li>● Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction.</li> <li>● Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for bird of prey. Poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.</li> <li>● More fauna is normally killed the faster vehicles travel. A speed limit should be enforced as determined by the mine environmental manager. It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences).</li> <li>● Travelling at night should be avoided or limited as much as possible. No travelling at night should be allowed without approval by the mine manager.</li> <li>● Lights should be positioned 5m from the roads or paved areas.</li> </ul>
Spread of alien and invader plant species	<ul style="list-style-type: none"> <li>● Control involves killing the alien invasive plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. The control of these species should even begin as soon as possible, considering that small populations of the invader plant species occur around the sites.</li> <li>● Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to site or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase.</li> <li>● Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.</li> <li>● Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds.</li> <li>● Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.</li> <li>● A detailed plan should be developed for control of noxious weeds and invasive plants that could colonise the area as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.</li> </ul>
Soil erosion and sedimentation	<ul style="list-style-type: none"> <li>● Sediment trapping, erosion and storm water control should be addressed by a hydrological engineer in a detailed storm water management plan.</li> <li>● The overall macro-channel structures and mosaic of cobbles and gravels must be maintained by ensuring a balance (equilibrium) between sediment deposition and sediment conveyance maintained. A natural flooding and sedimentation regime must thus be ensured as far as reasonably possible.</li> <li>● Steps must be taken to ensure that stormwater does not result in bank instability and excessive levels of silt entering the water course(s).</li> <li>● Stormwater must be diverted from construction works, access roads, linear infrastructure and must be managed in such a manner as to disperse runoff and to prevent the concentration of stormwater flow.</li> <li>● The velocity of stormwater discharges must be attenuated and the banks of the water courses protected.</li> <li>● Cover disturbed soils as completely as possible, using vegetation or other materials.</li> <li>● Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.</li> <li>● Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> </ul>

	<ul style="list-style-type: none"> <li>• Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.</li> <li>• Structures must be non-erosive, structurally stable and must not induce any flooding or safety hazard.</li> <li>• Structures must be inspected regularly for accumulation of debris, blockage, erosion of abutments and overflow areas - debris must be removed and damages must be repaired and reinforced immediately.</li> <li>• Necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures and activities and to prevent in-stream sedimentation.</li> <li>• Stockpiling of removed soil and sand must be stored outside of the 1:100 floodline and/or delineated riparian habitat and/or the regulated area of a water course, whichever is the greater, to prevent being washed into the channel and must be covered to prevent wind and rain erosion.</li> <li>• Slope/bank stabilisation measures must be implemented with a 1:3 ratio or flatter and vegetated with indigenous vegetation immediately after the shaping.</li> <li>• As much indigenous vegetation growth as possible should be promoted within the proposed development area in order to protect soil and to reduce the percentage of the surface area which is paved, hardened and/or compacted.</li> </ul>
Pollution	<ul style="list-style-type: none"> <li>• Ensure that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries. Buffers should be implemented around the wetland and riparian zones.</li> <li>• This risk of spillages of reagents and hydrocarbons on the soil during transportation can be reduced with proper maintenance of vehicles. This would include a rigorous and proactive maintenance program.</li> <li>• This risk can be further reduced through an adequate program of training of drivers and crews. This would include defensive driver training, basic vehicle maintenance, and emergency control of spills. In order for the vehicle crews to be adequately able to control any spills at an early stage, the vehicles must be properly equipped with spill containment equipment (booms, sandbags, spades, absorbent pads, etc.). Responsibility for training lies with the transport contractor. Adequate training, maintenance, and equipment of transport crews should be included as a requirement for transport contracts.</li> <li>• All employees will be trained in cleaning up of a spillage. The necessary spill kits containing the correct equipment to clean up spills will be made available at strategic points.</li> <li>• Pollution of and disposal/spillage of any material into the water course must be prevented, reduced, or otherwise remediated through proper operation, maintenance and effective protective measures.</li> <li>• Vehicles and other machinery must be serviced well outside the 1:100 year floodline or delineated riparian habitat, whichever is the greatest.</li> <li>• Oils and other potential pollutants must be disposed of at an appropriate licensed site, with the necessary agreement from the management of such a site.</li> <li>• Vehicles must be checked for oil leaks and all maintenance must take place at a designated site further than 32 meters from the boundary of the water course(s).</li> <li>• Any hazardous substances must be handled according to the relevant legislation relating to transport, storage and use of the substance and all storage facilities must be equipped with large, clearly readable material safety data sheets (MSDS).</li> <li>• All reagent storage tanks and reaction units must be supplied with a bunded area built to contain sufficient capacity of the facility and provided with sumps and pumps to return the spilled material back into the system. The system must be maintained in a state of good repair and standby pumps must be provided.</li> <li>• Silt, litter and hydrocarbon (oil) traps must be installed to minimise the risk of pollutants entering the natural drainage system of the area. A register must be in place to indicate that oils are recovered/recycled or alternatively disposed at a licensed facility.</li> <li>• Activities (including spill clean-up) must start up-stream and proceed into a down-stream direction, so that the recovery processes can start immediately, without further disturbance from upstream works.</li> <li>• Daily dampening of dust areas or other dust suppression methods such as dust-aside or more environmentally friendly methods.</li> <li>• Re-vegetation of impacted areas is to be conducted on an on-going basis.</li> <li>• Place dust generating activities where maximum protection can be obtained from natural features.</li> <li>• Locating dust generating activities where prevailing winds will blow dust away from users.</li> <li>• Minimize the need to transport and handle materials by placing adequate storage facilities close to processing areas.</li> <li>• Minimize the re-handling of material which obviously has cost benefits as well.</li> <li>• Exposed material should be protected from the wind by keeping it within voids or protecting it with topographical features where possible.</li> <li>• Protect activities from wind by erecting a screen or using a natural barrier.</li> <li>• All roads on site should be dampened or treated with a binding agent.</li> </ul>

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|  | <ul style="list-style-type: none"><li>• The general vehicle speed should be restricted as there is a direct relationship between the speed and vehicle entrained emissions. Speed limit on site should be 40km/h and on National roads 80km/h</li><li>• Monitoring, modelling and emission measurements should be regarded as complementary components in any integrated approach to exposure assessment or determining compliance against air quality criteria.</li></ul> |
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## IMPACT MANAGEMENT ACTIONS

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

<p style="text-align: center;"><b>ACTIVITY</b> Whether listed or not listed.</p> <p>(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.)</p>	<p style="text-align: center;"><b>POTENTIAL IMPACT</b></p> <p>(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc....etc...)</p>	<p style="text-align: center;"><b>MITIGATION TYPE</b></p> <p>(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)</p> <p>E.g.</p> <ul style="list-style-type: none"> <li>• <b>Modify through alternative method.</b></li> <li>• <b>Control through noise control</b></li> <li>• <b>Control through management and monitoring</b></li> </ul> <p style="text-align: center;"><b>Remedy through rehabilitation..</b></p>	<p style="text-align: center;"><b>TIME PERIOD FOR IMPLEMENTATION</b></p> <p>Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- .. Upon cessation of the individual activity</p>	<p style="text-align: center;"><b>COMPLIANCE WITH STANDARDS</b></p> <p>(A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)</p>
<p>Clearance of vegetation</p>	<p>Loss or fragmentation of habitats</p>	<p><b>Existing vegetation Actions</b></p> <ol style="list-style-type: none"> <li>1. Vegetation removal must be limited to the Mining site.</li> <li>2. No vegetation to be used for firewood.</li> <li>3. Exotic and invasive plant species should not be allowed to establish, if the development is approved.</li> </ol> <p><b>Demarcation of Mining area</b></p> <ol style="list-style-type: none"> <li>1. The Mining area must be well demarcated and no construction activities must be allowed outside of this demarcated footprint.</li> <li>2. Vegetation removal must be phased in order to reduce impact of construction/Mining.</li> <li>3. Site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.</li> <li>4. Strict and regular auditing of the Mining process to ensure containment of the Mining and laydown areas.</li> <li>5. Soils must be kept free of petrochemical solutions that may be kept on site during construction/Mining. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.</li> </ol> <p><b>Herbicides</b></p>	<p>Duration of operation</p>	<p>The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with NEMA and Duty of Care as prescribed by NEMA.</p>

		<p>6. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.</p> <p>7. The use of pesticides and herbicides on the site must be discouraged as these impact on important pollinator species of indigenous vegetation.</p> <p><b>Fauna</b></p> <p>8. Rehabilitation to be undertaken as soon as possible after Mining has been completed.</p> <p>9. No trapping or snaring to fauna on the construction/Mining site should be allowed.</p> <p>10. No faunal species must be disturbed, trapped, hunted or killed by maintenance staff during any routine maintenance at the development.</p>		
<p>Mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody</p> <p>– excavations</p>	<p>Loss of topsoil</p>	<ol style="list-style-type: none"> <li>1. The full depth of topsoil should be stripped from areas affected by construction/Mining and related activities prior to the commencement of major earthworks.</li> <li>2. Care must be taken not to mix topsoil and subsoil during stripping.</li> <li>3. The topsoil must be conserved on site in and around the pit/trench area.</li> <li>4. Subsoil and overburden in the Mining area should be stockpiled separately to be returned for backfilling in the correct soil horizon order.</li> <li>5. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.</li> <li>6. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.</li> <li>7. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage/leakage occurs should be attained and given to the project manager.</li> </ol>	<p>Duration of operation</p>	<p>The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with NEMA and Duty of Care as prescribed by NEMA.</p>

		<p>Establish an effective record keeping system for each area where soil is disturbed for Mining purposes. These records should be included in environmental performance reports, and should include all the records below.</p> <ul style="list-style-type: none"> <li>• Record the GPS coordinates of each area.</li> <li>• Record the date of topsoil stripping.</li> <li>• Record the GPS coordinates of where the topsoil is stockpiled.</li> <li>• Record the date of cessation Mining activities at the particular site.</li> <li>• Photograph the area on cessation of Mining activities.</li> <li>• Record date and depth of re-spreading of topsoil.</li> <li>• Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</li> </ul>		
Blasting		<ol style="list-style-type: none"> <li>1. Comply with the Mine Health and Safety Act, 29 of 1996 Regulations. The duties/functions are imposed on/assigned to Bila Civil Contractors (Pty) Ltd.</li> <li>2. Changes to drill and blast design to mitigate ground vibration.</li> <li>3. Changes to charging designs to mitigate air blast and fly rock.</li> <li>4. Proper and appropriate communication with neighbours about blasting, monitoring and actions done for proper control will be required.</li> <li>5. Blast designs should be reviewed on a regular basis to ensure all blasting activities are within the legal and accepted standards.</li> <li>6. Safe blasting distance and evacuation is calculated at a minimum distance of 493 m.</li> <li>7. Stop and Go procedures during blasting will be required.</li> <li>8. Implement monitoring programme for recording blasting operations.</li> <li>9. Attempts should be made to keep to the recommended ground vibration air blast limits (Table 26 within the Blast Impact Assessment Report).</li> <li>10. Blasting should occur in favourable weather conditions as far as possible.             <ul style="list-style-type: none"> <li>○ Do not blast too early in the morning when it is still cool or when there is a possibility of atmospheric inversion or too late in the afternoon in winter.</li> <li>○ Do not blast in fog.</li> <li>○ Do not blast in the dark</li> </ul> </li> </ol>		

		<ul style="list-style-type: none"> <li>○ Refrain from blasting when wind is blowing strongly in the direction of an outside receptor.</li> <li>○ Do not blast with low overcast clouds.</li> </ul> <ol style="list-style-type: none"> <li>11. Blasting notice boards must be sent up at various routes around the mining right area to inform the community of blasting dates and times.</li> <li>12. Monitoring could be done using permanent installed stations (consult Section 21, Figure 22 and Table 23 of the Blasting Impact Assessment report for suggested monitoring positions).</li> </ol> <p><b><u>Air blast and Fly rock:</u></b></p> <ol style="list-style-type: none"> <li>1. Increasing the stemming length ratio to blasthole diameter – either changing to a smaller diameter blasthole or increasing the actual stemming length.</li> <li>2. The use of aggregate stemming material of correct size ratio – 10 % of the blasthole diameter.</li> </ol> <p><b><u>Ground Vibration:</u></b></p> <ol style="list-style-type: none"> <li>1. Do blast design that considers the actual blasting, and the ground vibration levels to be adhered too.</li> <li>2. Change to bench heights with smaller diameter blastholes can be considered.</li> <li>3. Multiple charge decks in a blastholes initiated separately to reduce the charge mass per delay can be considered.</li> <li>4. Only apply electronic initiation systems to facilitate single hole firing.</li> <li>5. Do design for smaller diameter blast holes that will use fewer explosives per blast hole.</li> <li>6. Distance between blast and POI will have influence on the allowed charge mass per delay with regards to the different ground vibration limits, consult table 20 and table 21 in the Blast Impact Assessment specialist report.</li> </ol> <p><b><u>Underground workings:</u></b></p> <ol style="list-style-type: none"> <li>1) The charging and timing of blastholes should be recalculated not to exceed charge masses that will yield expected levels greater than 150 mm/s at the underground workings.</li> <li>2) A proper crown pillar distance between the underground workings and surface blasting must be confirmed – a rock engineer needs to make proper recommendation which must be implemented.</li> </ol>		
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	Erosion	<ol style="list-style-type: none"> <li>1. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion.</li> <li>2. All erosion control mechanisms need to be regularly maintained.</li> <li>3. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces.</li> <li>4. Retention of vegetation where possible to avoid soil erosion.</li> <li>5. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.</li> </ol>	Duration of operation	The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with NEMA and Duty of Care as prescribed by NEMA.
	Air Pollution	<p><b>Dust control actions</b></p> <ol style="list-style-type: none"> <li>23. A complaints register should be kept on site. All complaints should be logged in the complaints register and should be available on the site at all times.</li> <li>24. All complaints regarding air quality should be adequately investigated and actions taken to reduce the impact in a timely manner should it be required.</li> <li>25. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary.</li> <li>26. Implement and maintain a Dust and Emission Management Plan which provides clear details on preventing, maintaining, and improving the air quality in terms of site-specific activities.</li> <li>27. Should dust emission become a problem, a monthly dust fallout monitoring programme must be implemented.</li> <li>28. Note must be taken of incidents that cause air emissions and this must be recorded to ensure that these are resolved and prevented from reoccurring.</li> <li>29. Weekly site inspections should be undertaken in the vicinity of sensitive receptors. Records should be kept of these routine inspections.</li> <li>30. Plan the site layout in such a manner as to ensure that emission generating activities occur as far as possible from sensitive receptors.</li> <li>31. Ensure that all vehicles are maintained in good working condition and that they are serviced on a regular basis.</li> <li>32. Ensure that all vehicles are switched off when stationary – no vehicles should be idling for extended period.</li> <li>33. Impose and regulate a speed limit of 30 km/h on the site at all times.</li> <li>34. Provide speed-reduction structures positioned in the dirt access road to ensure maximum effectiveness at slowing down vehicles utilising this road.</li> </ol>	Duration of operation	The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with NEMA and Duty of Care as prescribed by NEMA.

		<p>35. Speed humps will need to be in place in order to assist in restricting truck drives from speeding</p> <p>36. A water car must be maintained and kept in good working order at all times. It is important for the water car to maintain a schedule for rounds to keep the roads damp and so assist in dust suppression.</p> <p>37. Water sprays to be applied at the area to be cleared should significant amounts of dust be generated.</p> <p>38. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover, seed or fence stockpiles to prevent wind whipping.</p> <p>39. Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles.</p> <p>40. Ensure travel distance between clearing area and topsoil piles to be at a minimum.</p> <p>41. Only remove the cover in small areas during work and not all at once.</p> <p>42. Ensure exposed areas remain moist through regular water spraying during dry, windy periods.</p> <p>43. Reshape all disturbed areas to their natural contours.</p> <p>44. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.</p> <p>45. Avoid bonfires and burning of waste materials</p>		
Air quality:	Dust Control	<p><b>Limit Cleared Areas</b></p> <p>16) Avoid clearing the entire site at once, instead clear areas as required in stages of the operation.</p> <p>17) In other areas, maintain the original vegetation cover for as long as possible;</p> <p>18) Before any site works commence, plan and locate the vegetation cover that needs to be retained;</p> <p>19) Protect this vegetation by fencing or blocking off from the rest of the site operations;</p> <p><b>Vegetative Stabilisation</b></p> <p>20) Retain as much existing vegetation as possible;</p> <p>21) If an area needs to be cleared, transplant established plants that must be disturbed to areas that need vegetation;</p> <p>22) If existing vegetation must be removed and cannot be immediately transplanted elsewhere, remove and maintain them for replanting at project completion. If trees and plants must be removed and it is not possible for them to be replanted,</p>		

		<p>consider chipping and using the material as mulch – the advantage is that reseeded of original vegetation can occur. Where possible, restore vegetation that is native to the area to maximise plant success and improve environmental conditions.</p> <p><b>Timing of the Development</b>                  23) Activities with high dust-causing potential, such as topsoil stripping, should not be carried out in sensitive areas during adverse wind conditions. When necessary, topsoil should be stripped in discrete sections, allowing buffer strips (windbreaks) between clearings.</p> <p><b>Wind Barriers</b>                  Wind barriers should be placed on site before commencement of works and when it is apparent that one is required during the phase of the operation. Consider the following options when placing barriers to prevent dust emissions:                  24) Wind barriers are most effective when placed perpendicular to the direction of the prevailing wind, but will have little or no effect when the wind direction is parallel to the fence;                  25) When choosing wind barriers, it has been observed that solid barriers provide significant reductions in wind velocity for relatively short leeward distances, whereas porous barriers provide smaller reductions in velocity for more extended distances;                  26) Wind barriers should be at least 2 metres high;                  27) The screening material should have a porosity of 50% or less.</p> <p><b>Earth Moving Management</b>                  28) Plan earth-moving works so that they are completed just prior to the time they are needed;                  29) Observe weather conditions and do not commence or continue earth moving works if conditions are unsuitable e.g., under conditions of strong winds;                  30) Reduce offsite hauling via balanced cut and fill operations;                  31) Pre-water areas to be disturbed.</p>		
	<p>Fugitive Dust – dustfall, PM10 &amp; PM2.5</p> <p>Material handling operations; exposed</p>	<p>12) Reduce height of material transfer at the crushing plant (e.g. miscellaneous transfer points).</p> <p>13) Water sprays for material handling operations (e.g. wet material while offloading trucks).</p> <p>14) Water sprays for drilling, blasting and bulldozing activities.</p> <p>15) Water sprays for stockpiles and material storage areas.</p>		

	<p>areas, stockpiles/dumps, mining activity (excavators, FELs, etc.); truck loading and offloading operations; crushing and screening; drilling, blasting, bulldozing, and material transfer points.</p>	<p>16) Wind breaks at material storage areas that are prone to dust emissions.          17) Use of vegetation, topsoil and/or rock armour on large stockpiles and dumps that are prone to wind erosion.          18) Partial or full enclosure of material transfer points, where applicable.          19) Regular maintenance of crushing and processing plant equipment, including dust suppression equipment, to ensure the equipment is operating properly.          20) Immediate clean-up of any material (i.e. ROM, waste rock/overburden and topsoil) spillages.          21) Conduct regular site inspections to ensure the dust mitigation measures are being implemented. Regular visual site inspections are recommended to assess whether further mitigation is required for any of the dust emission sources.          22) A dust management plan will need to be developed for onsite activities.</p> <ul style="list-style-type: none"> <li>• Dust control measures need to be assessed in detail and incorporated into the plan.</li> <li>• The plan should include appropriate mitigation measures as described in: Table 6-1 of the AQIA for all key dust emission sources during the operational phase.</li> </ul>		
	<p>Fugitive Dust – dustfall, PM10 &amp; PM2.5 &amp; Gases</p> <p>Vehicle dust entrainment, truck exhaust emissions and any other mining vehicle/equipment exhaust emissions</p>	<p>10) Have clearly defined hauling routes/vehicle access areas. These areas should preferably be paved (e.g. using surface coating such as bitumen), where possible or treated for dust suppression.          11) All main hauling roads should be treated for dust suppression (water spraying and chemical dust suppressants).          12) Conduct regular cleaning/sweeping of paved road surfaces to prevent the accumulation of dust.          13) Conduct regular maintenance and checks for haul road surfaces.          14) Immediate clean-up of any spillage.          15) All material that is being transported should be covered during transport (where possible).          16) Control the number of trucks on the road, weight of trucks and the travelling speed. Implement strict vehicle speed limits (e.g. 20-40 km/h).          17) Switch off engines whilst not in use;          18) Establish a maintenance schedule to ensure proper maintenance of the trucks &amp; mobile equipment;</p>		

		19) Conduct regular maintenance and quality checks (engines/tyres) for all heavy mobile equipment/trucks.		
Noise	Impact on surrounding area	<p><b>Actions to Noise Pollution</b></p> <ol style="list-style-type: none"> <li>1. Noise suppression measures must be applied to all equipment.</li> <li>2. Equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order.</li> <li>3. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from the site.</li> <li>4. Applying regular and thorough maintenance schedules to equipment and processes. An increase in noise emission levels very often is a sign of the imminent mechanical failure of a machine.</li> </ol>	Duration of operation	The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with NEMA and Duty of Care as prescribed by NEMA.
Heritage resources	Impact on potential cultural and heritage artefacts	<ol style="list-style-type: none"> <li>1) Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DEA.</li> <li>2) Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts/ fossils are uncovered in the affected area.</li> <li>3) The Contractor must ensure that his workforce is aware of the necessity of reporting any possible historical, archaeological or palaeontological finds to the ECO so that appropriate action can be taken.</li> <li>4) Known sites should be clearly marked in order that they can be avoided. The work force should also be informed that fenced-off areas are no-go areas.</li> <li>5) The ECO must also survey for heritage and palaeontological artefacts during ground breaking and digging or drilling. He/she should familiarise themselves with formations and its fossils or a palaeontologist should be appointed during the digging and excavation phase of the development.</li> <li>6) All digging, excavating, drilling or blasting activities must be stopped if heritage and/or palaeontological artefacts are uncovered and a specialist should be called in to determine proper management, mitigation, excavation and/or collecting measures.</li> <li>7) Any discovered artefacts or fossils shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and</li> </ol>	Duration of operation	The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with NEMA and Duty of Care as prescribed by NEMA.

		<p>noted. Permits shall be obtained from SAHRA should the proposed site affect any world heritage/palaeontology sites or if any heritage/palaeontology sites are to be destroyed or altered.</p> <p>8) Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA (Act No. 25 of 1999), Section 51. (1).</p> <p>9) According to the HIA there is a large cemetery on the proposed area (GPS Coordinates: 25°43'11.53"S 27°35'17.71"E). A 20m buffer zone must be placed around the graveyard in order to avoid potential damage during mining activities</p> <p>10) Cultural Heritage in South Africa (includes all heritage resources) is protected by the <b>National Heritage Resources Act (Act 25 of 1999) (NHRA)</b>. According to Section 3 of the Act, all Heritage resources include <b>“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”</b>.</p> <p>If such resources are found during the mining or development activities, they shall not be disturbed without a permit from the relevant heritage resource Authority, which means that before such sites are disturbed by development it is incumbent on the developer to ensure that a heritage impact assessment is done and the Provincial Heritage Resources Authority and SAHRA must be contacted immediately and work must stop.</p> <p>If anything of Archaeological and/or paleontological significance is found during the construction and operational phase of the mine the following applies:</p> <ul style="list-style-type: none"> <li>• NHRA 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</li> </ul>		
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		<ul style="list-style-type: none"> <li>• NHRA 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</li> <li>• NHRA 38(4)e – The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;</li> </ul> <p>If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the <b>Chance Find Protocol</b> must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.</p> <p><b>Chance Find Procedure</b></p> <ul style="list-style-type: none"> <li>• If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find.</li> <li>• The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.</li> </ul>		
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		<ul style="list-style-type: none"> <li>• A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.</li> <li>• Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.</li> </ul> <p>Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.</p> <ul style="list-style-type: none"> <li>• The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.</li> <li>• In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.</li> <li>• Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.</li> </ul> <p><b><u>Phase 1 Heritage Impact Assessment (Appendix 11)</u></b> The graveyard (burial site) must be included in the overall management plan of the mine development. Preservation of the site will require that the area is properly demarcated with at least a 20m buffer zone placed around the graveyard in order to avoid potential damage during mining activities.</p>		
Waste Management		<p><b>Remedial actions</b></p> <ol style="list-style-type: none"> <li>1. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site.</li> <li>2. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site.</li> </ol>	Duration of operation	The implementation of the recommended mitigation measures will result in the minimisation of impacts to acceptable standards, thereby ensuring compliance with



		<ol style="list-style-type: none"> <li>3. The ECO must determine the precise method of treatment for polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil.</li> <li>4. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material.</li> <li>5. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure.</li> <li>6. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.</li> <li>7. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.</li> </ol>		<p>NEMA and Duty of Care as prescribed by NEMA.</p>
<p>Water Use and Quality</p>	<p>Water pollution</p>	<p><b>Groundwater quality</b></p> <ol style="list-style-type: none"> <li>1. At least two groundwater monitoring boreholes must be drilled at the location indicated in Figure 8 of the Geohydrological Report (Appendix 11). <ul style="list-style-type: none"> <li>• The downstream borehole will monitor any possible groundwater contamination into neighbouring streams &amp; tributaries</li> <li>• The upstream borehole is considered a control borehole located further away from Mine activities</li> </ul> </li> <li>2. Conduct groundwater level monitoring on a weekly basis (Depending on the guidelines of the regulating authority)</li> <li>3. Macro chemical analysis within the mining right area, must be conducted after every three months or on a bi-annual basis.</li> <li>4. Use the results of the monitoring programme to confirm/validate the predicted impacts on groundwater availability and quality after closure;</li> <li>5. Update existing predictive tools to verify long-term impacts on groundwater, if required;</li> <li>6. The post closure contaminant potential should be determined during the operational phase;</li> <li>7. The DWA Mine Closure Best Practice Guidelines should be adhered to where relevant;</li> <li>8. Pollution control dam could be used to intercept polluted seepage water. This should be considered if it is found. Regular sampling of the surface water/pit water is essential;</li> </ol>		

		<p>9. Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine; and</p> <p>10. Audit the monitoring network annually.</p>		
	Spread of alien invasive species	<p><b>Proposed Actions</b></p> <ul style="list-style-type: none"> <li>• These species should be eradicated and controlled to prevent further spread beyond the study area;</li> <li>• It is suggested that an alien plant removal program be initialised within the study area in order to help reinstate more natural hydrological and ecological functions to within the project site;</li> <li>• Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;</li> <li>• Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;</li> </ul>		

**Specialist mitigation measures:**

Riverine Baseline Study (Appendix 11)

Ecology of all watercourses associated with the proposed mining right area.

Impacts	Mitigation measures:
<p><u>Construction phase</u></p> <p>Vegetation and topsoil clearing</p> <p>Construction of associated infrastructure such as access and haul roads</p> <p>Bulk material storage and handling</p>	<ul style="list-style-type: none"> <li>• It is proposed that the southern tributary is diverted around active workings.</li> <li>• It is proposed that the extent of the open pit within the 100m buffer is realigned.</li> <li>• All riparian buffer areas must be avoided.</li> <li>• Areas where construction is to take place must be clearly demarcated. Any areas not demarcated must be completely avoided;</li> <li>• Stockpiling or storage of materials and/or waste must be placed beyond the defined buffers for each respective activity and clearly demarcated;</li> <li>• Tarps must be used to cover stockpiles when not in use;</li> <li>• Barriers and berms to capture runoff from both the construction areas as well as the topsoil stockpiles must be implemented;</li> <li>• No vehicles are to be serviced on open site, a suitable workshop with appropriate pollution control facilities should be utilised offsite;</li> <li>• Suitable stormwater and groundwater management, which will reduce erosion and sedimentation, must be established and implemented per pit. The implementation of said plans should be audited annually;</li> <li>• All fuels must be stored in a suitable storage device on an impermeable surface outside of the delineated buffer zones; and</li> <li>• All vehicle operators should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;</li> </ul>
<p><u>Operational Phase</u></p> <p>Operation of open cast mine (blasting, pit formation, extraction, etc)</p>	<ul style="list-style-type: none"> <li>• It is proposed that the southern tributary is diverted around active workings;</li> <li>• It is proposed that the extent of the open pit within the 100m buffer is realigned;</li> <li>• All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;</li> <li>• Drilling equipment shall be equipped with a closed cabin to reduce noise and dust exposure.</li> </ul>

<p>Use of access and haul roads</p> <p>Use of large diesel equipment and vehicles</p> <p>River diversion</p>	<ul style="list-style-type: none"> <li>All riparian buffer zones must be avoided;</li> <li>The implementation of concurrent rehabilitation with roll-over mining methods;</li> <li>Alien vegetation removal in areas surrounding the open pit to be completed on a continuous basis;</li> <li>Effective stormwater and management to divert water around the open pit areas;</li> <li>No discharge of contaminated water to occur via open pit dewatering;</li> <li>Appropriate Pollution Control Dams (PCD's) should replace the current dirty water storage area in the current southern tributary;</li> <li>Open pit dewatering efforts should occur in the form of dust suppression on haul roads;</li> <li>The use of dust-suppression misting systems to mitigate dust emissions associated with the crushing and screening of mining ore;</li> <li>If conveyors are used on site, they must be covered in order to minimise the effects of wind;</li> <li>The use of appropriate stockpiles for overburden and waste rock must be implemented in designated areas;</li> <li>Implementation of sedimentation and erosion control in drainage surrounding the open cast areas;</li> <li>Consideration should be given to the use of erosion berms to prevent gully formation and siltation of the surrounding watercourses;</li> <li>While avoidances is the preferred course of action, if mining must commence in the whole extent of Portion 2, a WULA must be conducted for the diversion of the southern tributary, around the mining operations;</li> <li>A rehabilitation plan for the diverted southern tributary must be drafted for the Elandskraal Chromium Mine;</li> <li>A groundwater assessment must be conducted to understand patterns of subsurface flow and its interaction with local watercourses to better predict potential risks;</li> <li>A floodline determination should be conducted for the proposed mining activities in order to determine the extent of the 1:100 year flood of the southern tributary. This is to mitigate the flooding of pits and required for all PCD design specifications;</li> <li>An annual adaptive water resource monitoring programme, whereby recommendations must be suitable implemented; and Bi-annual aquatic biomonitoring studies.</li> </ul>
<p><u>Decommissioning (Closure &amp; Post Closure) Phase</u></p> <p>Clearing of associated infrastructure</p> <p>Rehabilitation of infrastructure footprint</p> <p>Mine drainage decant</p> <p>Alterations to subsurface flow</p>	<ul style="list-style-type: none"> <li>Backfill all pits with overburden;</li> <li>The area must be contoured for a free draining landscape;</li> <li>The southern tributary must be rehabilitated to a natural channel allowing for flow;</li> <li>Erosion and sedimentation control must be in place within 1 month of completing the decommissioning phase for each pit;</li> <li>Establish a treatment facility for the water in the PCD's where the TDS and TSS can precipitate out and clean water discharged back into the watercourse;</li> <li>Complete avoidance of riparian buffer zones; and</li> <li>Alien vegetation removal in areas surrounding the open pit areas, completed on a continuous basis.</li> <li>Fertile topsoil must be brought into site for rehabilitation;</li> <li>Erosion and sedimentation control must be in place and an annual survey should be completed until at-least complete vegetation rehabilitation (as determined by an appropriate specialist);</li> <li>Alien invasive plant management plan must be in place; and</li> <li>Groundwater modelling of potential</li> </ul>

**Specialist mitigation measures:**

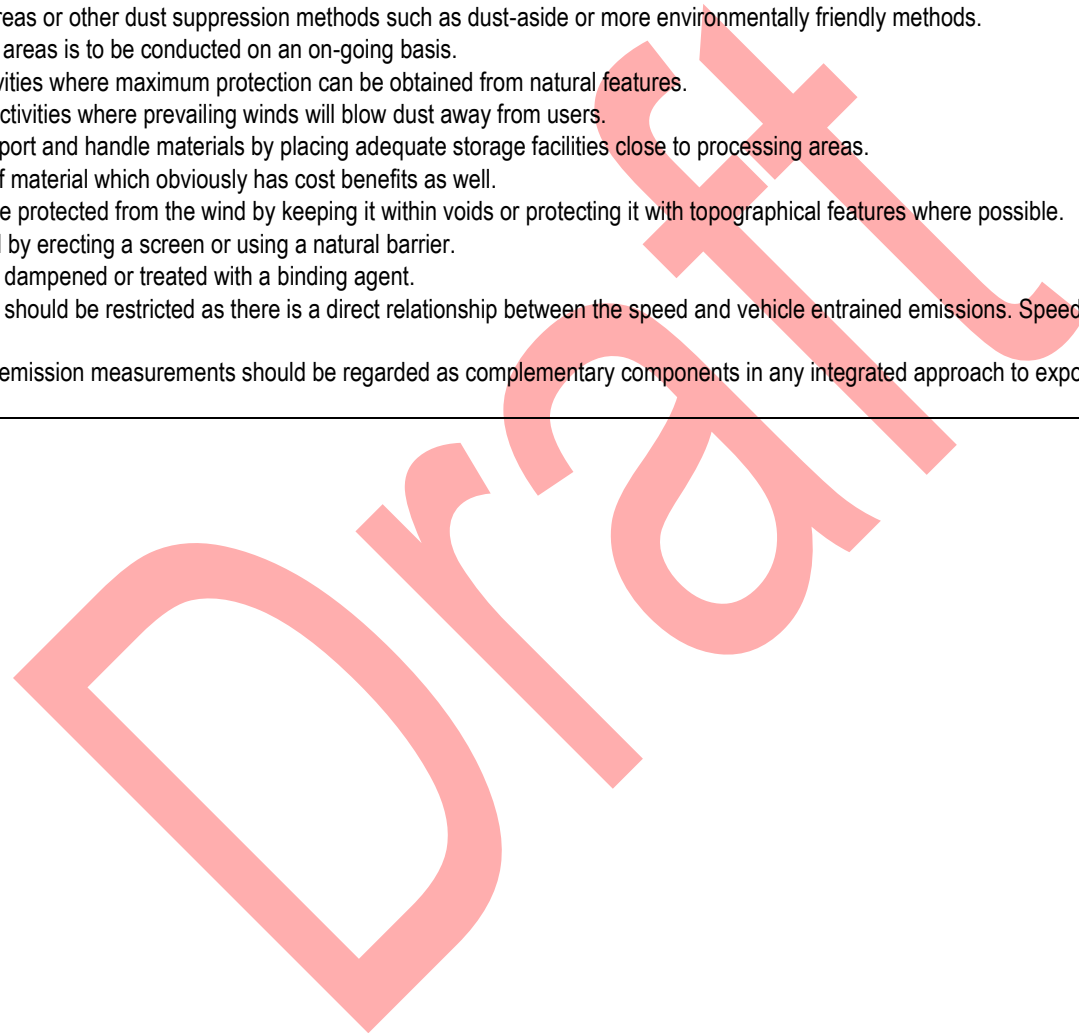
Terrestrial Biodiversity Impact Assessment (**Appendix 11**)

Impacts	Mitigation measures:
Removal of indigenous vegetation	<ul style="list-style-type: none"> <li>Rehabilitation: revegetate or stabilise all disturbed areas as soon as possible. Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions, while reseeded of exposed areas should be considered a high priority to allow a stable grass cover that prevent erosion.</li> </ul>

	<ul style="list-style-type: none"> <li>• The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust).</li> <li>• Conservation of topsoil should be prioritised on site and done as follows:             <ul style="list-style-type: none"> <li>○ Topsoil should be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify;</li> <li>○ Topsoil stockpiles should preferably not exceed a height of 2 meters (maximum height of 5 meters where applicable) where possible. The topsoil outer layer should also be protected from wind erosion by the use of wind nets and soil binders. If topsoil needs to be stockpiled for longer than 12 months, seeding will improve long term stability and help to keep the soil in an active state. Keeping all the topsoil stockpiles at a height of 2 metres is however not feasible as it would create a large topsoil footprint area.</li> <li>○ Topsoil stockpile heights in excess of 5 meters and duration of storage until the end of the mining operations will likely destroy the bulk of propagates and most of the soil microbes. This can be countered by ensuring proper rehabilitation of the stockpile itself and additional augmentation of the rehabilitated areas where the stored topsoil will finally be placed. In order to reduce the risk of degrading the topsoil when placed in a single large topsoil stockpile and to prevent cross zoning of soils from different vegetation types, it is recommended that topsoil originating from different areas should be stored separately during the operational phase. Dust suppression would likely be a priority. It is recommended that topsoil from stockpiles in excess of 5 meters be used first for concurrent rehabilitation.</li> <li>○ Stockpile topsoil separately from subsoil;</li> <li>○ Stockpile in an area that is protected from storm water runoff and wind;</li> <li>○ Maintain topsoil stockpiles in a weed free condition;</li> <li>○ Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it;</li> <li>○ Stockpile topsoil for the minimum time period possible i.e. strip just before the relevant activity commences and replace as soon as it is completed.</li> </ul> </li> </ul>
<p>Habitat destruction</p>	<ul style="list-style-type: none"> <li>• Concurrent rehabilitation should occur during the operational phase on all exposed areas created by construction as well as roads, stockpiles and the overburden facility. Only indigenous species should be used for rehabilitation. The following programmes should be implemented as part of the operational phase of the mine:             <ul style="list-style-type: none"> <li>○ Concurrent rehabilitation programme</li> <li>○ Alien invasive eradication programme</li> <li>○ Fire management programme</li> <li>○ Educational and training programme on conservation and ecological systems</li> </ul> </li> </ul>
<p>Disturbance of fauna and fauna fatalities</p>	<ul style="list-style-type: none"> <li>• Limit movement and mining activities to disturbed areas where possible.</li> <li>• Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction.</li> <li>• Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for bird of prey. Poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.</li> <li>• More fauna is normally killed the faster vehicles travel. A speed limit should be enforced as determined by the mine environmental manager. It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences).</li> <li>• Travelling at night should be avoided or limited as much as possible. No travelling at night should be allowed without approval by the mine manager.</li> <li>• Lights should be positioned 5m from the roads or paved areas.</li> </ul>
<p>Spread of alien and invader plant species</p>	<ul style="list-style-type: none"> <li>• Control involves killing the alien invasive plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. The control of these species should even begin as soon as possible, considering that small populations of the invader plant species occur around the sites.</li> <li>• Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to site or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase.</li> <li>• Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.</li> <li>• Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds.</li> <li>• Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.</li> </ul>

	<ul style="list-style-type: none"> <li>• A detailed plan should be developed for control of noxious weeds and invasive plants that could colonise the area as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.</li> </ul>
Soil erosion and sedimentation	<ul style="list-style-type: none"> <li>• Sediment trapping, erosion and storm water control should be addressed by a hydrological engineer in a detailed storm water management plan.</li> <li>• The overall macro-channel structures and mosaic of cobbles and gravels must be maintained by ensuring a balance (equilibrium) between sediment deposition and sediment conveyance maintained. A natural flooding and sedimentation regime must thus be ensured as far as reasonably possible.</li> <li>• Steps must be taken to ensure that stormwater does not result in bank instability and excessive levels of silt entering the water course(s).</li> <li>• Stormwater must be diverted from construction works, access roads, linear infrastructure and must be managed in such a manner as to disperse runoff and to prevent the concentration of stormwater flow.</li> <li>• The velocity of stormwater discharges must be attenuated and the banks of the water courses protected.</li> <li>• Cover disturbed soils as completely as possible, using vegetation or other materials.</li> <li>• Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.</li> <li>• Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>• Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.</li> <li>• Structures must be non-erosive, structurally stable and must not induce any flooding or safety hazard.</li> <li>• Structures must be inspected regularly for accumulation of debris, blockage, erosion of abutments and overflow areas - debris must be removed and damages must be repaired and reinforced immediately.</li> <li>• Necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures and activities and to prevent in-stream sedimentation.</li> <li>• Stockpiling of removed soil and sand must be stored outside of the 1:100 floodline and/or delineated riparian habitat and/or the regulated area of a water course, whichever is the greater, to prevent being washed into the channel and must be covered to prevent wind and rain erosion.</li> <li>• Slope/bank stabilisation measures must be implemented with a 1:3 ratio or flatter and vegetated with indigenous vegetation immediately after the shaping.</li> <li>• As much indigenous vegetation growth as possible should be promoted within the proposed development area in order to protect soil and to reduce the percentage of the surface area which is paved, hardened and/or compacted.</li> </ul>
Pollution	<ul style="list-style-type: none"> <li>• Ensure that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries. Buffers should be implemented around the wetland and riparian zones.</li> <li>• This risk of spillages of reagents and hydrocarbons on the soil during transportation can be reduced with proper maintenance of vehicles. This would include a rigorous and proactive maintenance program.</li> <li>• This risk can be further reduced through an adequate program of training of drivers and crews. This would include defensive driver training, basic vehicle maintenance, and emergency control of spills. In order for the vehicle crews to be adequately able to control any spills at an early stage, the vehicles must be properly equipped with spill containment equipment (booms, sandbags, spades, absorbent pads, etc.). Responsibility for training lies with the transport contractor. Adequate training, maintenance, and equipment of transport crews should be included as a requirement for transport contracts.</li> <li>• All employees will be trained in cleaning up of a spillage. The necessary spill kits containing the correct equipment to clean up spills will be made available at strategic points.</li> <li>• Pollution of and disposal/spillage of any material into the water course must be prevented, reduced, or otherwise remediated through proper operation, maintenance and effective protective measures.</li> <li>• Vehicles and other machinery must be serviced well outside the 1:100 year floodline or delineated riparian habitat, whichever is the greatest.</li> <li>• Oils and other potential pollutants must be disposed of at an appropriate licensed site, with the necessary agreement from the management of such a site.</li> <li>• Vehicles must be checked for oil leaks and all maintenance must take place at a designated site further than 32 meters from the boundary of the water course(s).</li> <li>• Any hazardous substances must be handled according to the relevant legislation relating to transport, storage and use of the substance and all storage facilities must be equipped with large, clearly readable material safety data sheets (MSDS).</li> <li>• All reagent storage tanks and reaction units must be supplied with a bunded area built to contain sufficient capacity of the facility and provided with sumps and pumps to return the spilled material back into the system. The system must be maintained in a state of good repair and standby pumps must be provided.</li> </ul>

- Silt, litter and hydrocarbon (oil) traps must be installed to minimise the risk of pollutants entering the natural drainage system of the area. A register must be in place to indicate that oils are recovered/recycled or alternatively disposed at a licensed facility.
- Activities (including spill clean-up) must start up-stream and proceed into a down-stream direction, so that the recovery processes can start immediately, without further disturbance from upstream works.
- Daily dampening of dust areas or other dust suppression methods such as dust-aside or more environmentally friendly methods.
- Re-vegetation of impacted areas is to be conducted on an on-going basis.
- Place dust generating activities where maximum protection can be obtained from natural features.
- Locating dust generating activities where prevailing winds will blow dust away from users.
- Minimize the need to transport and handle materials by placing adequate storage facilities close to processing areas.
- Minimize the re-handling of material which obviously has cost benefits as well.
- Exposed material should be protected from the wind by keeping it within voids or protecting it with topographical features where possible.
- Protect activities from wind by erecting a screen or using a natural barrier.
- All roads on site should be dampened or treated with a binding agent.
- The general vehicle speed should be restricted as there is a direct relationship between the speed and vehicle entrained emissions. Speed limit on site should be 40km/h and on National roads 80km/h
- Monitoring, modelling and emission measurements should be regarded as complementary components in any integrated approach to exposure assessment or determining compliance against air quality criteria.



**Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including**

**G. MONITORING OF IMPACT MANAGEMENT ACTIONS**

**H. MONITORING AND REPORTING FREQUENCY**

**I. RESPONSIBLE PERSONS**

**J. TIME PERIOD FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS**

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Clearance of vegetation	Loss or fragmentation of habitats	<ul style="list-style-type: none"> <li>Conduct regular internal audits</li> <li>Conduct regular external audits</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Manager</li> <li>Suitable qualified environmental auditor</li> </ul>	Monitoring should be undertaken for duration of operations. Internal audits should be undertaken at least every 6 months. External audits should be undertaken by a suitably qualified auditor on an annual basis. Reports should be made available to the competent authority if required.
Mining of Chrome Ore, Phosphate Ore, Manganese Ore, Nickel Ore, Platinum Group Minerals (PGM), Vanadium Ore, Stone Aggregate (from waste dumps) (STW) and associated minerals within the orebody	Loss of topsoil, Erosion, Air Pollution, Noise, Impact on potential cultural and heritage artefacts,	<ul style="list-style-type: none"> <li>Conduct regular internal audits</li> <li>Conduct regular external audits</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Manager</li> <li>Suitable qualified environmental auditor</li> </ul>	Monitoring should be undertaken for duration of operations. Internal audits should be undertaken at least every 6 months. External audits should be undertaken by a suitably qualified auditor on an annual basis. Reports should be made available to the competent authority if required.
Waste management	Pollution	<ul style="list-style-type: none"> <li>Conduct regular internal audits</li> <li>Conduct regular external audits</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Manager</li> <li>Suitable qualified environmental auditor</li> </ul>	Monitoring should be undertaken for duration of operations. Internal audits should be undertaken at least every 6 months. External audits should be undertaken by a suitably qualified auditor on an annual basis. Reports should be made available to the competent authority if required.
Water Use and Quality	Water pollution (Ex-situ water chemistry analysis) Aquatic biomonitoring assessments	<ul style="list-style-type: none"> <li>Conduct regular internal audits</li> <li>Conduct regular external audits</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Manager</li> <li>Suitable qualified environmental auditor</li> </ul>	Monitoring should be undertaken for duration of operations. Internal audits should be undertaken at least every 6 months. External audits should be undertaken by a suitably qualified auditor on an annual basis. Reports should be made available to the competent authority if required.

Blasting	Noise and Blasting vibrations	<ul style="list-style-type: none"> <li>• Conduct regular internal audits</li> <li>• Conduct regular external audits</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Manager</li> <li>• Suitable qualified environmental auditor</li> </ul>	<p>A monitoring programme for recording blasting operations is recommended.</p> <p>The following elements should be part of such a monitoring system:</p> <ul style="list-style-type: none"> <li>• Ground vibration and Airblast results.</li> <li>• Blast information summary.</li> <li>• Meteorological information at time of blast.</li> <li>• Video Recording of blast if possible.</li> <li>• Fly rock observations</li> </ul>
Air quality	Dustfall	<ul style="list-style-type: none"> <li>• Conduct regular internal audits</li> <li>• Conduct regular external audits</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Manager</li> <li>• Suitable qualified environmental auditor</li> </ul>	<p>In terms of the Draft National Dust Control Regulations, monthly dustfall monitoring should be undertaken using the ASTM D1739-98 (reapproved 2017) method.</p> <p>Follow the recommendations as provided in the Air Quality Impact Assessment (<b>Appendix 11</b>)</p>



**K. A PROGRAM FOR REPORTING ON COMPLIANCE, TAKING INTO ACCOUNT THE REQUIREMENTS AS BY THE REGULATIONS;**

External audits should be undertaken by a suitably qualified auditor on an annual basis. Reports should be made available to the Competent Authority if required.

**L. AN ENVIRONMENTAL AWARENESS PLAN DESCRIBING THE MANNER IN WHICH—**

- (i) **Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.**

**Bila Civil Contractors (Pty) Ltd** will implement an Environmental Awareness Plan which will include various mechanisms for informing employees of environmental risks resulting from their work, including:

- Induction training for full –time staff and contractors.
- In-house training sessions to be held with relevant employees.
- On the job training regarding environmental issues
- Training and skills development

The above measures will be implemented through an Environmental Communication Strategy to be implemented.

See the attached **Appendix 10** for the Awareness plan.

- (ii) **Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.**

**Bila Civil Contractors (Pty) Ltd** will implement an incident reporting and reporting procedure in order to identify risks timeously and implement actions to avoid or minimise environmental impacts.

**M. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY**

- Specialist studies

\*\*\*\*\*END OF THE REPORT\*\*\*\*\*