DRAFT CONSOLIDATED EIA/EMPR FOR THE PROPOSED WASTE ROCK DUMP EXPANSION, TAILINGS STORAGE FACILITY AND ASSOCIATED INFRASTRUCTURE INCLUSIVE OF EXISTING AND HISTORICAL ACTIVITIES AT TWEEFONTEIN SECTION (LP30/5/1/2/3/2/1(214)EM)

For

Samancor Chrome Limited
Eastern Chrome Mines

Located on:
Portions 1, 3(RE), 4, 5(RE), 6 and 9 of the farm Tweefontein 360 KT
Fetakgomo-Greater Tubatse Local Municipality
Limpopo Province

August 2021

Submitted for: Public Review and Comment
30 August 2021 – 30 September 2021

Please forward all Comments before close of business 30 September 2021 to:

Gudani Environmental and Social Scientists (Pty) Ltd.
P.O. Box 714, Faunapark, Polokwane, 0787.
Tel: 015 291 3620 / 5669. Fax 086 235 9820.
Email: itumeleng@gudaniconsulting.co.za.
For attention: Itumeleng Senamela
Ref: TWEEFONTEIN TAILINGS STORAGE FACILITY

Report Compiled by:

Prescali Environmental Consultants (Pty) Ltd

P.O. Box 2544
Montana Park
0159
Tel: 012 543 3808
Fax 086 621 0294
E-mail: info@prescali.co.za

Title:

Draft Consolidated EIA/EMPr for the proposed waste rock dump expansion, tailings storage facility and associated infrastructure inclusive of existing and historical activities at Tweefontein Section (LP30/5/1/2/3/2/1(214)EM) for Samancor Chrome Limited Eastern Chrome Mines located on: Portions 1, 3(RE), 4, 5(RE), 6 and 9 of the Farm Tweefontein 360 KT, Fetakgomo-GreaterTubatse Local Municipality, Limpopo Province

Client:

Samancor Chrome Limited
Eastern Chrome Mines
PO Box 3
Steelpoort
1133

Telephone No: 013 230 7027
Fax No.: 013 230 7082

Report no:

Samancor/ECM/Tweefontein/EIA_EMPr/2021/V1(draft for comment)

Document prepared by:

Prescali Environmental Consultants (Pty) Ltd
P.O. Box 2544
Montana Park
0159

Telephone No: 012 - 543 3808
Fax No: 086 - 621 0294

May 2021

DOCUMENT CONTROL

	Name	**Signature**	**Date**
Compiled:	Dr Petro Erasmus *(Pri.Sci.Nat)(EAPASA)*		2021-04-19
Checked:	Elaine van der Linde *(Pri.Sci.Nat)*		2021-05-05
Checked:	Gregory Netshilindi *(Cand Nat Sci) (EAPASA))*		2021-05-20
Finalised	Dr. Petro Erasmus *(Pri.Sci.Nat)(EAPASA)*		

Applicant Approval

I, ____, duly authorised by Samancor Chrome Ltd, Eastern Chrome Mines, hereby confirm that the report has been reviewed and approved for submission to the DMR.

____________________________ ________________

Signature Date

REVISION AND AMENDMENTS

Description of Revision / Amendment	**No**	**Date**
Approved EMPr dated October 1995 stamped by DMR dated 12/11/2006. Approval letter stamped by DMR dated 1999.	1	1995
Amendment to the approved environmental management programme report dated 2006.	2	2006
Amendment to the approved environmental management programme report dated 2013. Approval letter stamped by DMR dated 02/12/2015.	3	2013
This Report Consolidated EIA/EMPr For The Proposed Waste Rock Dump Expansion, Tailings Storage Facility And Associated Infrastructure Inclusive Of Existing And Historical Activities At Tweefontein Section (LP30/5/1/2/3/2/1(214)EM)	4	2021

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
And
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DRAFT CONSOLIDATED EIA/EMPR FOR THE PROPOSED WASTE ROCK DUMP EXPANSION, TAILINGS STORAGE FACILITY AND ASSOCIATED INFRASTRUCTURE INCLUSIVE OF EXISTING AND HISTORICAL ACTIVITIES AT TWEEFONTEIN SECTION (LP30/5/1/2/3/2/1(214)EM)

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Samancor Chrome Limited – Eastern Chrome Mines
TEL NO: +27 13 230 7027
FAX NO: +27 13 230 7082
POSTAL ADDRESS: PO Box 3, Steelpoort, 1133
PHYSICAL ADDRESS: Portions 1, 3(RE), 4, 5(RE), 6 and 9 of the Farm Tweefontein 360 KT
FILE REFERENCE NUMBER SAMRAD: LP30/5/1/2/3/2/1(214) EM

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.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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 manage, avoid or mitigate identified impacts; and
(h) identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Tweefontein Mine is an operational mine located on the various portions of the Farm Tweefontein 360 KT within the Fetakgomo-Greater Tubatse Local Municipality, Limpopo province. Tweefontein Mine is focused on the continued development of the Eastern Chrome Mines and remains critical to Samancor Chrome's long term sustainable growth. The mining activities are authorized in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). The existing EMPr's to be consolidated into this report are the following:

- Samancor Chrome Mines – Tweefontein Section Application for mining authorisation Environmental management programme report - approved in 1999;
- Samancor chrome Mines – EMPr dated 2006; and
- Addendum to the approved EMPr for a mining right – approved in 2015.

The baseline data for Tweefontein Mine has been sourced from previous work undertaken for the above listed EMPr's and respective amendments and addendums. Where specialist studies have been updated, the relevant information has been incorporated into this report.

PURPOSE OF THIS REPORT

The objective of the EMPr Consolidation is to align Tweefontein Mine's existing EMPr's with the MPRDA and associated Regulations, and consolidate them into a single document. The result of this consolidated EMPr is one document containing all relevant information that acts as a comprehensive management tool for the mine, by providing an easy-to-use system in which to administer Tweefontein Mine's commitments and generate a constructive process to monitor and audit commitments.

As an existing underground and opencast mine, Tweefontein Section is proposing to establish a new tailings storage facility (TSF) as the existing two dams are nearing their design capacity. In addition, the existing Waste Rock Dump (WRD) footprint area will be expanded to allow for the continuation of the mining activity and deposition of the material.

As part of the amendment of the approved EMPr's the following specialists were appointed in 2020/2021:

- Civil Engineering;
- Socio-Economic;
- Groundwater;
- Surface water;
- Fauna and Flora;
- Noise;
- Soil;
- Visual;
- Archaeological; and
- Air quality.

CONCLUSIONS

The EMPr Consolidation (this report) has been structured to meet the requirements of the National Environmental Management Act, 1998 (Act no. 107 of 1998) (NEMA) and its Regulations as amended from time to time. This document replaces all previous Tweefontein EMPr's submitted to the DMR.

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ABBREVIATIONS

(Pty)	Proprietary
(RE)	Remaining extend
BID	Background information document
Cm	centimetre
Cr2O3	Chrome
DAFF	Department of Agriculture, Fisheries and Forestry
DEAT	Department of Environmental Affairs and Tourism
DM	District Municipality
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECM	Eastern Chrome Mines
ENPAT	Environmental Potential Atlas for South Africa
Fax	Facsimile
FGTLM	Fetakgomo Greater Tubatse Local Municipality
FIDP	Final integrated Development Plan
GDP	Gross Domestic Product
GNR	Government Notice Regulation
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
Km	kilometre
Km2	Square kilometre
L	litre
LEDET	Department of Economic Development, Environment and Tourism Limpopo
LEMA	Limpopo Environmental Management Act
LG	Lower Group
LM	Local Municipality
Ltd	Limited
Mamsl	meters above mean sea level
ME	Mitigation efficiency
MG	Middle Group
Mm	millimetre
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NEMAQA	National Environmental Management Air Quality Act
NEMBA	National Environmental Management Biodiversity Act
NEMWA	National Environmental Management Waste Act
NHRA	National Heritage Resources Act
No	Number
NWA	National Water Act
ºC	Decrees Celsius
OLEMF	Olifants and Letaba Rivers Environmental Management Framework
RoM	Run of Mine
RoR	Rate or Rise
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SLP	Social and Labour Plan
Tel	Telephone
TSF	Tailings Storage Facility
UG	Upper Group
WM	With Mitigation
WOM	Without Mitigation
WRD	Waste Rock Dump
WWTW	Waste Water Treatment Works

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1. Details of:

1.1.1. The Environmental Assessment Practitioner (EAP) who prepared the report

Name of the Practitioner: Prescali Environmental Consultants. The report was compiled by Dr Petro Erasmus (Pri.Sci.Nat)(EAPASA).

Tel No.: 012 543 3808
Fax No.: 086 621 0294
E-mail address: info@prescali.co.za

1.1.2. Expertise of the EAP

1.1.2.1. The qualifications of the EAP

(*With evidence attached as Appendix 1).*

Dr. P. Erasmus has qualifications in Zoology and Biochemistry and further studied in Zoology and Marine pollution. She is registered as a Natural Professional Scientist (Pri.Sci.Nat.) with SACNASP for Ecological and Environmental Sciences, Registration number 116207. She is also registered as an EAP with Environmental Assessment Practitioners Association of South Africa (EAPASA) Registration number 2019-1473. Her qualifications are provided in Appendix 1.

Reviewers:

- Ms. E. van der Linde has qualifications in Geology, Engineering Geology and Environmental Management and experience in Water and Environmental Management. She is registered as a Pri.Sci.Nat. (SACNASP), Natural Professional Scientist, Registration number 400219/05. She is also registered as an EAP with Registration number 2020-2414. Her qualifications are provided in Appendix 1.
- Mr G. Netshilindi has qualifications in Geology, Environmental & Geographical Sciences and Introduction in Project Management. He is a Candidate Natural Scientist and a member of the Geological Society of South Africa. He is also registered as an EAP with EAPASA (Environmental Assessment Practitioners Association of South Africa) Registration number 2018-141. His qualifications are provided in Appendix 1.

1.1.2.2. Summary of the EAP's past experience.

(Attach the EAP's curriculum vitae as Appendix 2)

Dr. P. Erasmus has 15 years of applicable experience (a short resume with a list of projects is attached in Appendix 2 and has been employed by:

- Department: Water Affairs and Forestry (DWAF);
- M2 Environmental Connections (Pty) Ltd; and
- Prescali Environmental Consultants (Pty) Ltd.

Reviewers:

- Ms. E. van der Linde has 20 years of applicable experience (a short resume with a list of projects is attached in Appendix 2 and has been employed by:
    - Department: Water Affairs and Forestry (DWAF);
    - Groundwater Consulting Services cc;
    - M2 Environmental Connections cc;
    - Prescali Environmental Consultants (Pty) Ltd.
- Mr G. Netshilindi has 5 years applicable experience (a short resume with a list of projects is attached in Appendix 2) and has been employed by:
    - Minmet Services (Pty) Ltd
    - Tshikovha Green and Climate Change Advocates (Pty) Ltd
    - Prescali Environmental Consultants (Pty) Ltd

2. DESCRIPTION OF THE PROPERTY

The proposed project will be located on the farm portions as outlined in Table 2-1 for the operational area known as Tweefontein Section. Samancor Chrome Ltd is the surface rights owner of the properties as outlined in the Mining Right and below.

Table 2-1: Description of the property

Farm Name:	Portions 1, 3(RE), 4, 5(RE), 6 and 9 of the farm Tweefontein 360 KT
Application area (Ha)	**Portion** **Area** 1 1929.5468 Ha 3 (RE) 54.6573 Ha 4 34.0176 Ha 5 (RE) 287.5255 Ha 6 414.2632 Ha 9 14.2338 Ha
Magisterial district:	Makhuduthamaga [Sekhukhune] Magisterial District
Local district:	Fetakgomo-Greater Tubatse Local Municipality
Distance and direction from nearest town	The nearest town is Steelpoort approximately 18 km north-east from Tweefontein.
Cadastral Codes	T 0 K T 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 0 1 T 0 K T 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 0 3 T 0 K T 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 0 4 T 0 K T 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 0 5 T 0 K T 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 0 6 T 0 K T 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 0 9

Details of Mining Rights held by Samancor on Tweefontein 360:

Portion Number	Mineral	Area (ha)	Reference
Remainder of Mineral Area 1	Chromite	114.4760	K3347/03RM
Remainder of Mineral Area 2	Chromite	185.968	K1003/93RM
Mineral Area 4	Chromite	34.2355	K1003/93RM
Mineral Area 5	Chromite	44.1594	K1003/93RM
Mineral Area 6	Chromite	14.9544	K1003/93RM
Portion 1	Chromite	1974,410	T8269/1993
Portion 5	Chromite	359,3224	T21516/2008
Portion 9	Chromite	14,2366	T54997/1993

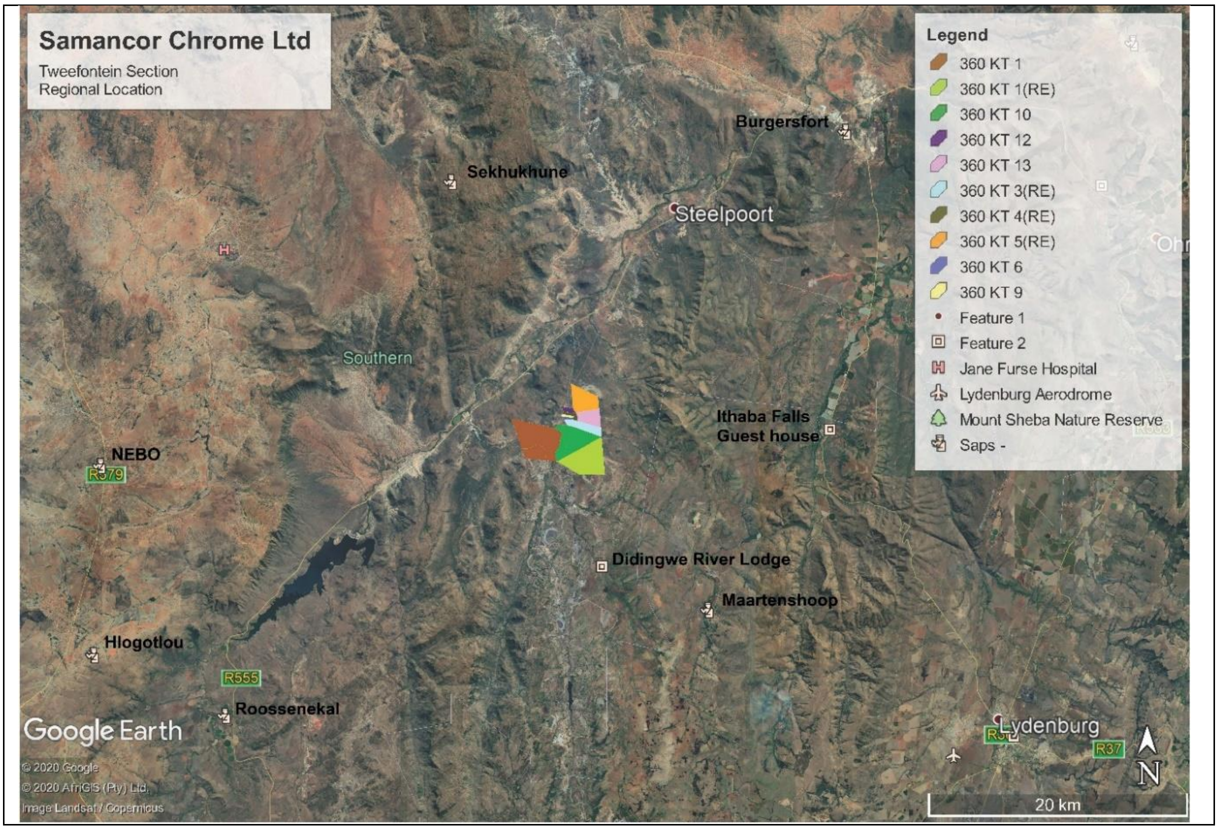
A section 102 amendment was approved on 24/07/2020 to approve the following mineral for inclusion into the mining right:

- platinum, palladium, rhodium, ruthenium, iridium,osmium, gold, silver, copper, nickel and cobalt, which may be extracted from normal mining of Chromite in the Middle Group (MG) and Lower Group (LG) Reefs. Samancor will not be mining the UG2 Reef or the Merensky Reef)

2.1. Locality Map

(show nearest town, scale not smaller than 1:250 000 attached as Appendix 3)

The nearest town is Steelpoort located approximately 18 km north-east from Tweefontein Section. Larger locality maps have been appended in this report as Appendix 3.



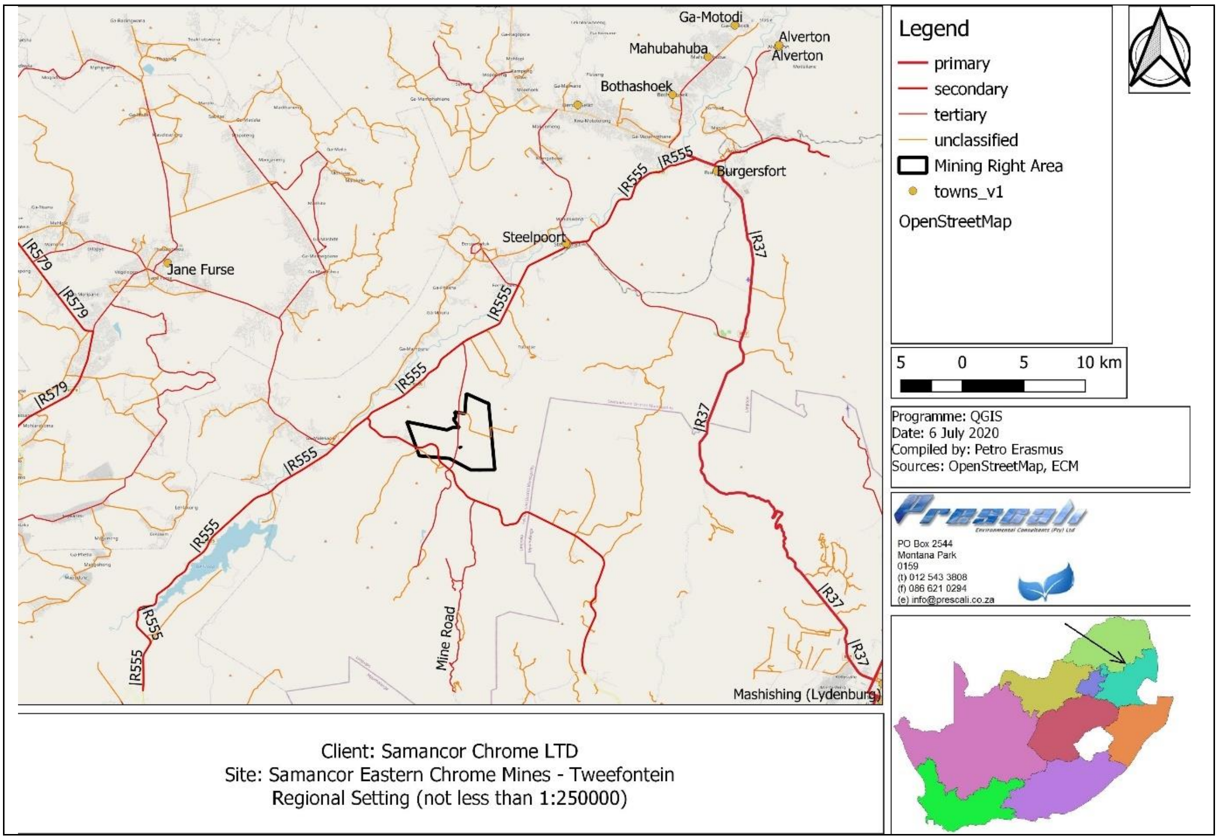


Figure 2-1: Regional locality map for Tweefontein Section

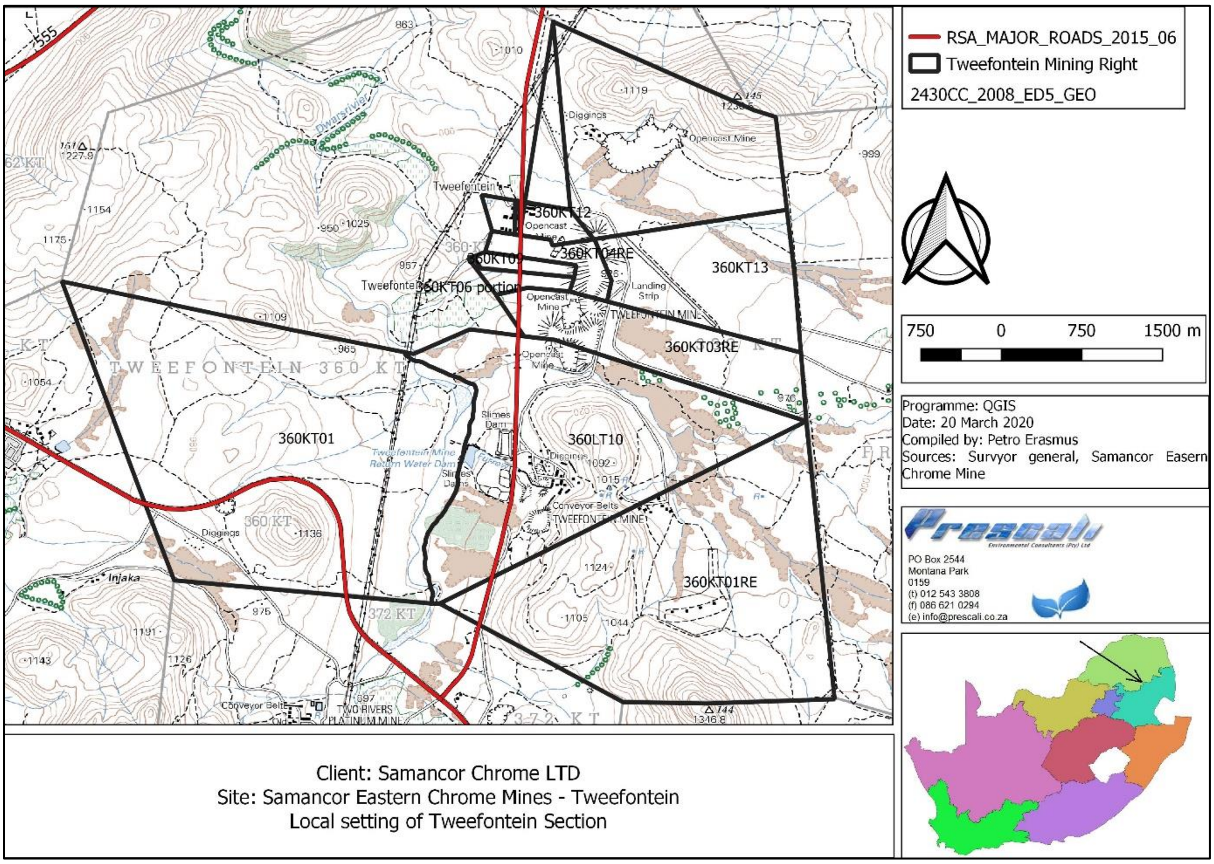


Figure 2-2: Tweefontein Section mining area

3. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

Tweefontein Mine currently makes use of both underground and opencast mining methods to access the reef via decline shaft, Hoogenoeg and Klarinet Opencasts. Table 3-1 below provides a summary of the infrastructure and activities that were included in the each of the existing EMPr's, along with current status of development of the infrastructure.

Table 3-1: Summary of existing infrtastructures and authorisations

Prospecting activity	Descriptions	Status	Auhtorisation Date	Document Source
Mining				
Target Mineral	Chromite	Approved	1999	1999 EMPr
Product	Chrome	Approved	1999	1999 EMPr
Mining method	Underground	Approved	1999	1999EMPr
	Opencast	Approved	2006	2006 EMPr
Process				
Main Plant		Approved	1999	1999 EMPr
WHIMS Plant		Approved	2015	2015 EMPr
Tailings retreatment Plant		Approved	2015	2015 EMPr
Fines Plant		Approved	2015	2015 EMPr
Waste and Residue Disposal				
Waste Rock Dump		Approved	1999 2016	1999 EMPr Water use licence
Taillings Storage Facility		Approved	1999 2015 2016	1999 EMPr 2015 EMPr Water use licence
Industrial Waste disposal	Salvage yard on site for reclamation	Approved	2006	2006 EMPr
Other mine infrastructure				
Sewage plant		Approved	1999 2015 2016	1999 EMPr 2015 EMPr Water use licence
Surface Conveyors		Approved	1999	1999 EMPr
Haul Road		Approved	1999	1999 EMPr
Roads		Approved	1999	1999 EMPr
Powelines		Approved	1999	1999 EMPr
Transportation of people and material	Crushed ore will be transported from shafts to the processing plant via the haul road in trucks with a 30-50 tonne carrying capacity; Concentrate will then be transported off site via 30-50 tonne enclosed trucks along the main access road; and	Approved	1999	1999 EMPr

	Tailings will be transported to the tailings dam via an enclosed pipeline.			
Water Supply		Approved	1999 2015 2016	1999 EMPr 2015 EMPr Water use licence
Crushing plant		Approved	1999	1999 EMPr

3.1. Listed and Specified Activities

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares (Ha)) of all the aforesaid main and listed activities, and infrastructure to be placed on site and attach as Appendix 4

Please refer to Appendix 4.

3.1.1. 2020 expansion activities

An outline of the new listed activities to be included in the Environmental Authorisation and Waste Licence as outlined below.

Table 3-2: Listed and Specified Activities to be authorised

NAME OF ACTIVITY	Aerial extent of Activity	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
(All activities including activities not listed) (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.)	**m^2 or Ha**	**Mark with an X Where applicable or affected.**	**GNR LN1: 983 / LN2 984 / LN =3: 985 (2014 as amended in 2017)**
Storm water management infrastructure will be developed around the TSF area, these will not be pipelines but open culverts which may exceed the 0.36 m diameter or the 120l/s peak throughput.	TSF: (2,000 m x 4 m) 8,000 m^2	X	Develop LN1: #9
Tailings and return water pipeline will be expanded from the existing plant to the new TSF. These will be longer than 1 km and it is not expected that it will exceed 0.36 m diameter or 120 l/s, however an application is included should it be needed. As far as possible the pipelines will be located next to internal roads.	2,000 m x 2 pipelines	X	Expand: LN1: #46
The diversion of the unnamed tributary as well as the construction of the TSF across the pre-diverted unnamed tributary will result in the removal and infilling of material in excess of 10 m^3.	1 ha	X	LN1: #19
An access road will be developed around the TSF. The roads will not be wider than 8 meters**.** Most of the Tweefontein area is classified as ecological support or CBA areas.	2 ha	X	Expansion: LN3: #18
The TSF, WRD expansion and River diversion areas will require vegetation clearance that **will exceed 20 ha area** in an ecological support / CBA area.	24 ha	X	LN2: #15 LN3: #12

NAME OF ACTIVITY	Aerial extent of Activity	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
Should any protected plant species require relocation as a result of the proposed activities a permit will be applied for in terms of the NEMBA	1 ha (assumption)	X	LN1: #30
The new storm water dam at the TSF will require a Water use licence.	1 ha (assumption)	X	Development: LN2: #6
The application is for an amended mining right as a result of the proposed opencast and associated minerals being applied for.	2734.2172 ha	X	LN2: #17
Development of a new residue deposit (Tailing storage facility), expansion of the waste rock dump and new residue stockpile	24 ha	X	GN921 (29 Nov 2013) as amended - Category B #11
Re-mining of the existing TSFs as well as the New TSF.	40 ha	X	

3.1.2. Listed Activities triggered by the existing operational activities - pre-NEMA commencement

The listed activities that would require auhtorisation in terms of NEMA should they have commenced after the 2006 listing notices publication (and the amendments thereafter) are indicated below. As the activities commenced before the repeal of the MPRDA sections and the subsequent replacement by NEMA, these are consided to tbe Existing Lawfull activities. Please note that only existing activities are considered Existing Lawful activities as any expansion activities will be included in a new environmental authorisation process.

Table 3-3: Existing Lawful use activities and how it relates to Listing notice activities

Comment	Listing notice
Various pipelines are applicable to the Tweefontein section. The combined length of which exceeds 1 km. It is very likely that some of the flows may be equal or exceed 120 litres per second but unlikely that they exceed 0.36 m in diameter.	LN1 #9
Various electricity lines are applicable to Tweefontein section which may have a capacity of 33 - 275 kV. It is unlikely that the 275 kV will be exceeded by the Tweefontein operations.	LN1 #11 or LN2 #9
Various culvert, opencast areas and infrastructures are located within 32 m of watercourses and combined this exceeds 100 square meters.	LN1 #12
There are several water storage hydrex dams at Tweefontein section and the combined capacity exceed 50 000 m^3.	LN1 #13
There is various areas where dangerous goods are stored and this includes and explosives storage area which will be between 80 - 500 m^3 and may even exceed 500 m^3 taking into consideration the AEL operations.	LN1 #14 or LN2 #4
Various existing roads exist at Tweefontein Section of which some are wider than 8 meters of which some may occur in Ecological important areas.	LN1 #24 and LN3 #4
The combined area cleared of vegetation for tailings dams, plants, building etc., has exceeded 20 Ha.	LN2 #15 (>20 ha)
It is very possible that as part of the original start up trees on the national list may have been removed.	LN1 #30
S102 amendment to the existing mining right	LN1: #21D
Reclamation of residue stockpiles and deposits	LN1:#21F
Various historic and existing activities required a water use licence and this has been applied for and issued. Where applicable amendments to licences or approvals has been applied for.	LN1 #34 and LN2 #6
As an operational mine Tweefontein conducts their operations in a phased approached. Specific reference is made to the following listed activities under Listing notice 1 #9, #11, #12, #13 and #14.	LN1 #67
There are several dams at Tweefontein that combined exceed 10 ha – this includes the tailings dams	LN2 #16

Comment	Listing notice
Tweefontein has a mining right in terms of the MPRDA	LN2 #17
Construction and operation of existing tailings storage facilities as well as the reclamation of these.	N921:A #15, B #10, B #11
Tweefontein section will comply with the norms and standards as published in terms of the NEMWA for: • Sorting of waste; and • Recycling and recovery of wastes.	N921: C

3.2. Description of the Activities to be Undertaken

(Describe Methodology or technology to be employed, and for a linear activity, a description of the route of the activity)

3.2.1. Existing activities

This EMPr document is compiled to reflect the current mining related activities taking place at Tweefontein Mine. This report was drafted to meet the NEMA requirements.The following activities, actions or processes are taking place or have taken place at Tweefontein Section as per the approved EMPr's dated 1995, 2006 and 2013 in a phased approach. A surface infrastructure site layout plan is provided in Figure 3-1, Figure 3-2, Figure 3-3 and Figure 3-4.

- **Design, investigation and construction phase (1970's – present and ongoing in a phased approach as needed).** Mining at Tweefontein Section started in the 1970's, opencast mining at Klarinet in 2006 and at Hoogenoeg in 2014. The mine is continuously expanding and developing new infrastructure / opencast areas as per the approved mine works plan and EMPr. The following infrastructures are included here:
    - Access and internal roads;
    - Fence;
    - General surface infrastructures: Offices, workshops, lamp room, change houses, parking areas, stores, AEL explosive storage, explosive emulsion silo towers;
    - Waste water treatment works (WWTW) / Sewage Works;
    - Crushing and screening plant;
    - ROM beneficiation and railings retreatment plants with supporting infrastructures;
    - Tailings Storage Facility (TSF);
    - Storm water / Return water dam;
    - Storm water infrastructure;
    - Conveyor belt;
    - Waste Rock Dump (WRD);
    - Electrical substation and power lines;
    - Salvage yard;
    - Potable and process water pipelines;
    - Boxcut area (Klarinet opencast / Hoogenoeg opencast);
    - Adits / shafts;
    - Overburden and topsoil stockpiles;
    - Explosive storage areas (AEL);
    - Bridges/culverts;
- Operational phase (1970's to 2053): management and operation of:
    - Opencast mining areas (Klarinet opencast / Hoogenoeg).
    - Underground mining areas (Including undermining of the Dwars River) and adits. As per the 2018 Mine Works Plan, the grand total resource (MG1 and MG2) still available for exploitation by means of underground mining are 53.51 Mt and includes measured, indicated and inferred resources for Tweefontein and Dwars River). The extend of the MG1 and MG2 mineral resource that will be exploited

are indicated in Figure 3-5 and Figure 3-6. The inferred resource estimate for PGMs is 53.51 Mt. (Samancor Chrome Ltd, 2018).

- Crushing and screening of ROM;
- Beneficiation of ROM;
- Overburden and soil stockpiles;
- Product stockpiles;
- Storm water / return water dams;
- Waste rock dump;
- Tailings storage facility;
- Waste water treatment works(WWTW)/Sewage Works;
- Process and potable water;
- Explosive storage areas (AEL); and
- Reclamation of tailings dams.

As part of continues rehabilitation the following have taken place as needed:

- Rehabilitation, closure and post closure phase: management completed opencast mining areas;
- Closure of shafts / adits as needed;
- Removal of unneeded surface infrastructures, e.g. roads, buildings etc.;
- Removal and rehabilitation of soil stockpiles, backfilling of opencast areas with overburdens; and
- Reclamation of TSFs;

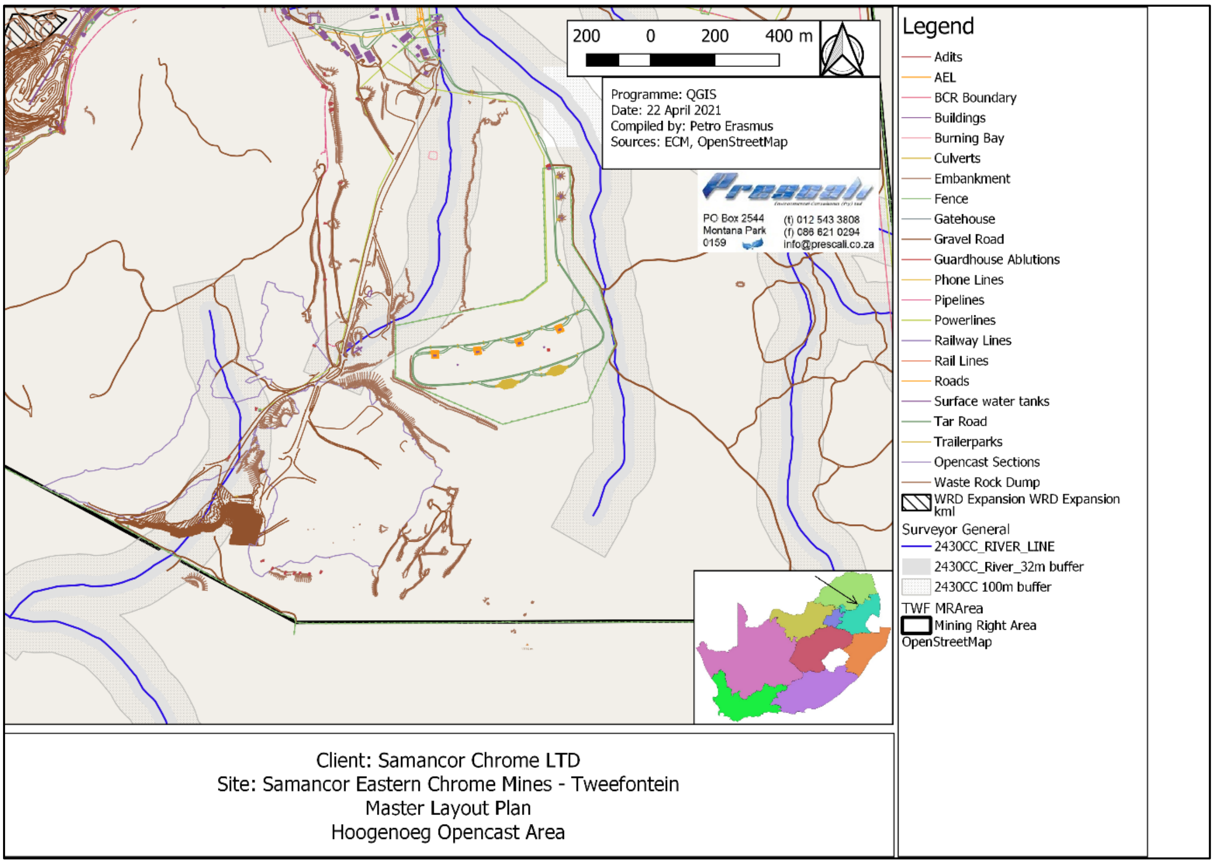


Figure 3-1: Hoogenoeg Opencast area

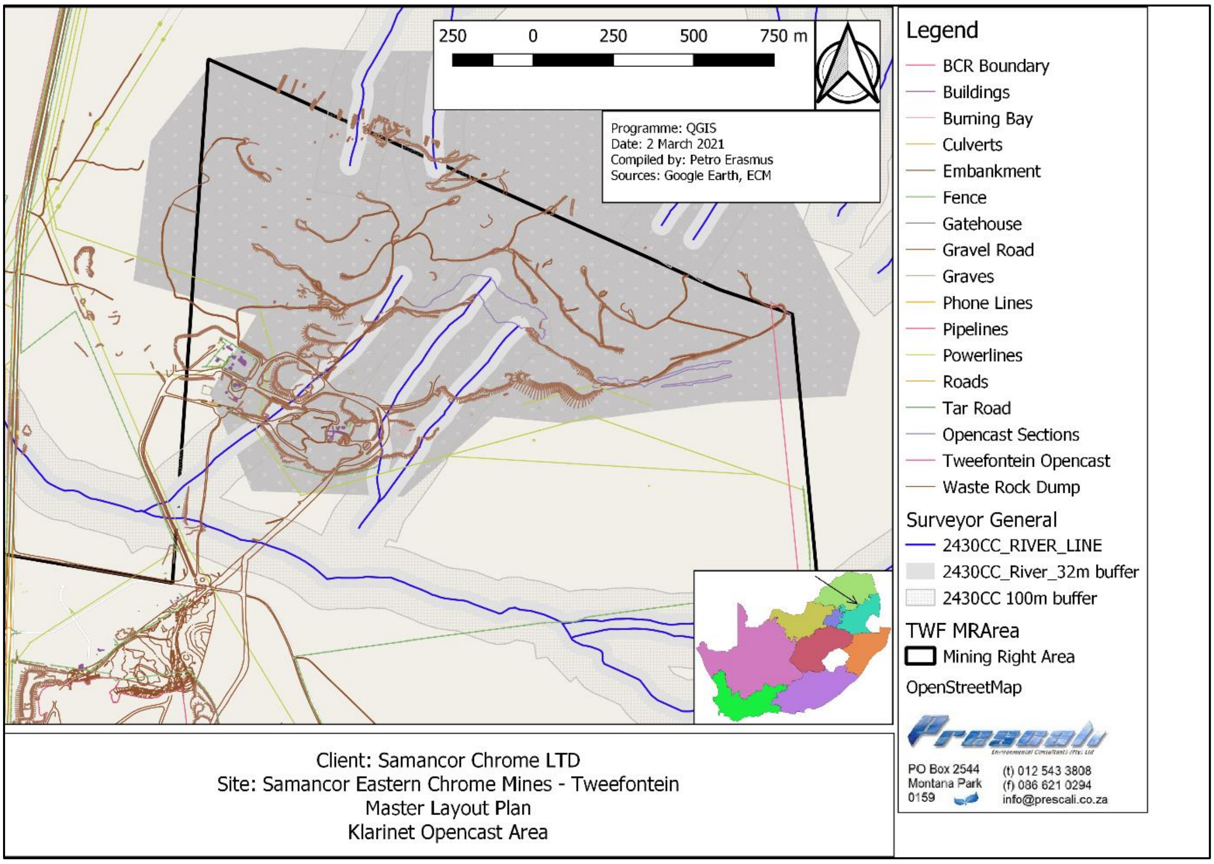


Figure 3-2: Klarinet opencast area

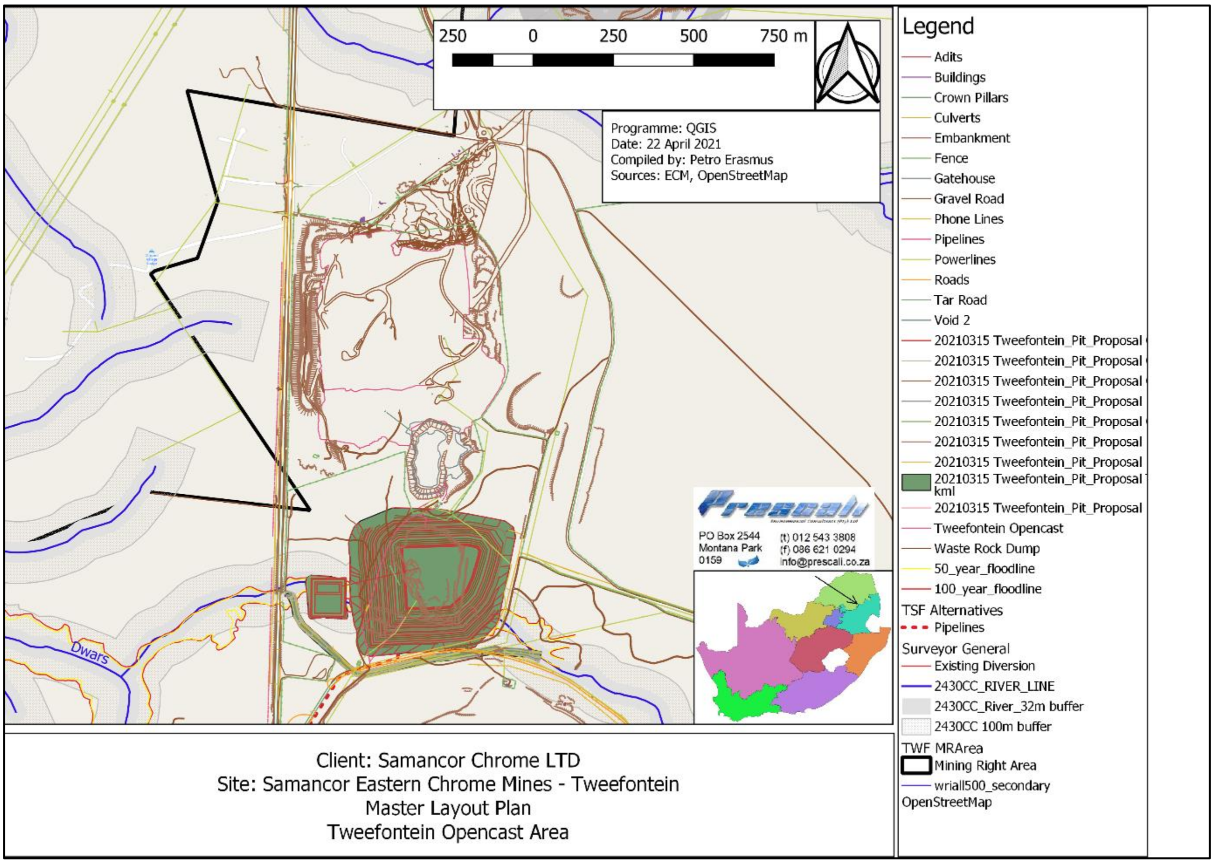


Figure 3-3: Tweefontein New TSF and opencast site layout

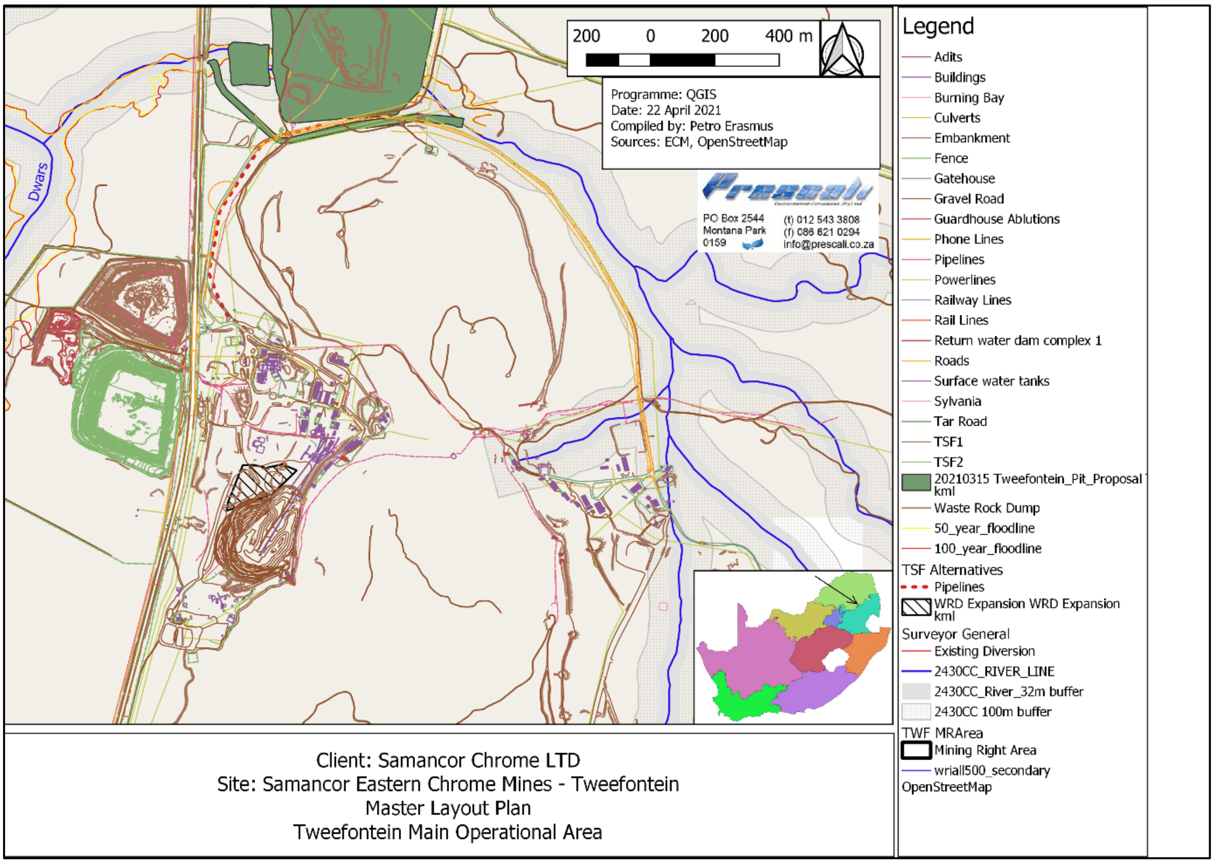


Figure 3-4: Processing and existing TSF area

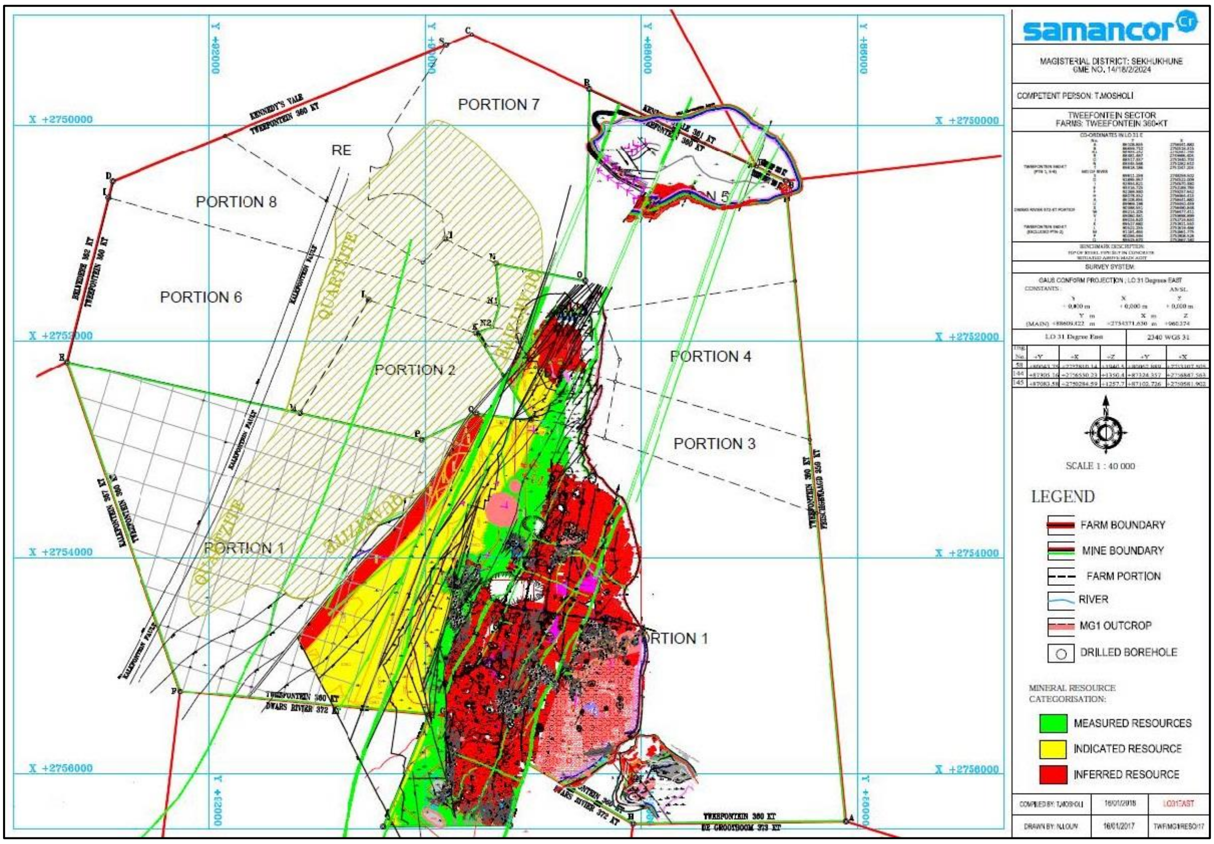


Figure 3-5: MG1 Mineral resource map (Samancor Chrome Ltd, 2018)

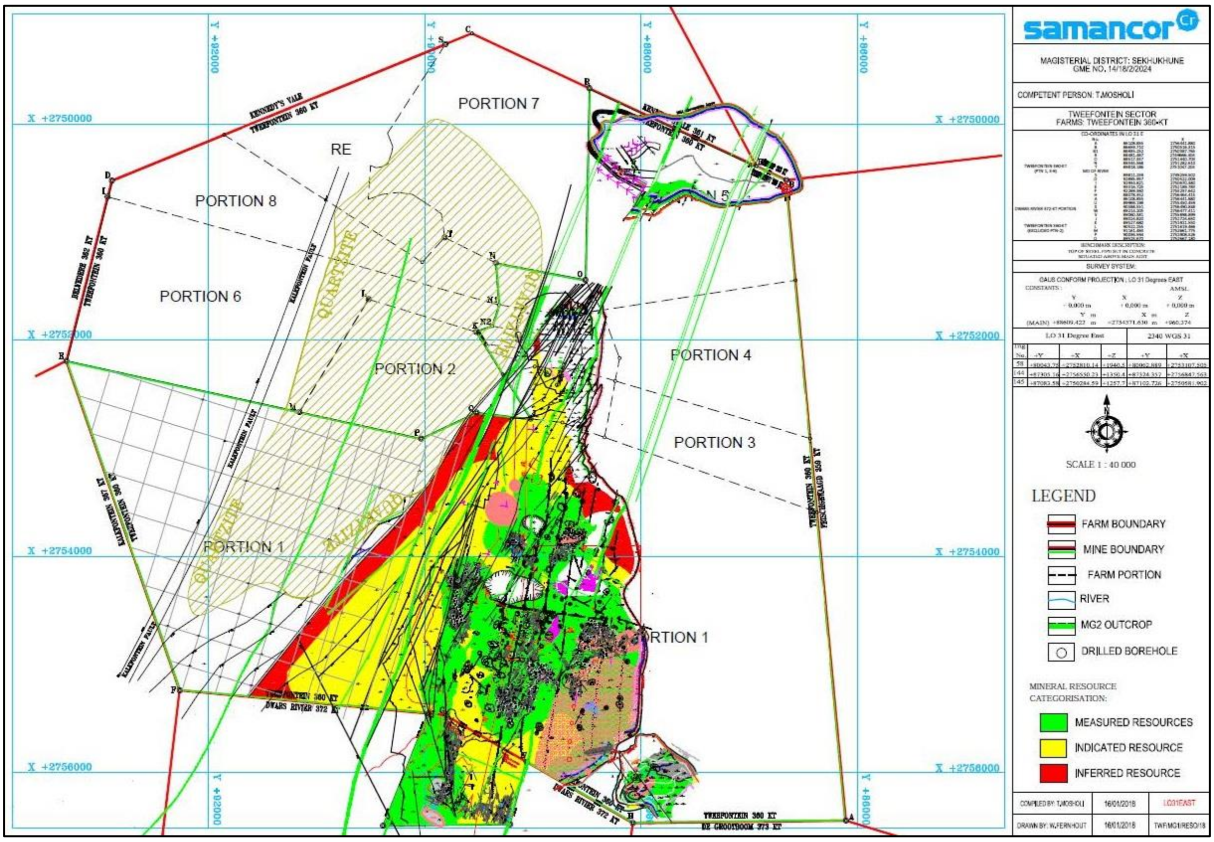


Figure 3-6: MG2 Mineral Resource map (Samancor Chrome Ltd, 2018)

3.2.1.1. Closure phase (2053 – 2063)

Rehabilitation, including maintenance and monitoring activities are envisioned to take approximately 5 years. While rehabilitation activities would be completed in approximately 2 years, maintenance and monitoring activities are envisaged to take an additional 3 years. Activities that will be undertaken during this phase as per the approved Closure Plan are:

- Final sloping and vegetation of rehabilitated opencast mining areas;
- Closure of shafts / adits;
- Removal of unneeded surface infrastructures, e.g. roads, offices, Explosive storage areas etc. as indicated in the construction phase;
- Final sloping and vegetation of stockpiles, overburdens, WRD; and
- Final rehabilitation of the TSF, storm water / return water dams.

3.2.2. New Activities

3.2.2.1. New tailing storage facility and return water dam

As the first phase of the new TSF construction the existing pit area will be backfilled. Backfilling of the pit is already licenced in the existing Water Use Licence, in light of new regulations ECM is in the process of investigating bacterial “treatment” of the tailings that will be used to backfill the pit before the new TSF is constructed on top of the backfilled footprint. This project is in the pre-feasibility stage and the option for a 6 month pilot project is being investigated.

With regards to the design of the new TSF the following is noteworthy:

- The total capacity is 4.566 million m^3. At in situ density of 1.78 t/m^3 this would provide a storage capacity for 8.128 million tons.
- The starter wall top would be about 4.82 m from the natural ground level (NGL) at the lowest point. At this elevation the Rate of Rise (RoR) ≈ 4.0m/yr.
- Volumetric modelling considered the limitation of 5.0 m/yr on the RoR. Side slopes were modelled at a 1:3 overall slope.
- At the Tweefontein production rate of 40 000 dry tons per month, this would supply storage capacity for 16.9 years.

The return water dam will have the following compartments:

- Cleaning sump: 12.5 m^3;
- Operational compartment: 5 496 m^3 which is designed for 7 days operational water requirements;
- Storm water compartment: 21 004 m^3.

3.2.2.2. New river diversion

As a result of the location of the new TSF, the need to divert Unnamed tributary of the Dwars River was identified. The design of the diversion was conducted by Tailings Solutions (Tailings Solutions, 2021). The new length of the diverted watercourse will be approximately 943 m and has been sized to cater for the 1:50 year rainfall event.

3.2.2.3. Expansion of the Waste Rock Dump (WRD)

The existing WRD footprint area will be increased on an area directly adjacent to the existing dump. The area is already a brownfield with very little natural vegetation remaining. A detailed design report was compiled for the expansion area. The expansion area will have a capacity of 453 000 m^3 and provide storage for approximately 48.5 months at a rate of 19 725 tons per month.

4. POLICY AND LEGISLATIVE CONTEXT

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	**REFERENCE WHERE APPLIED**
(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 2 of the Constitution states that: "*This Constitution is the supreme law of the Republic; law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled*." Section 24 of the CA, states that *everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* • prevent pollution and ecological degradation; • promote conservation; and • secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Section 24 guarantees the protection of the environment through reasonable legislative (and other measures) and such legislation is continuously in the process of being promulgated. Section 33(1) concerns administrative justice which includes the constitutional right to administrative action that is lawful, reasonable and procedurally fair.	The draft EIA/EMPr Report was accordingly prepared and considered within the constitutional framework set by Section 24 and 33 of the Constitution.
The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Environmental Assessment Regulations, 2014 (as amended) The overarching principle of the NEMA is sustainable development. It defines sustainability as meaning *the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure the development serves present and future generations*. Section 2 of NEMA provides for National Environmental Management Principles. These principles include: • Environmental management must place people and their needs at the forefront of its concern. • Development must be socially, environmentally and economically sustainable. • Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated. • Environmental justice must be pursued.	The Draft EIA/EMPr Report will be distributed for public review for periods stipulated in NEMA as part of the environmental impact assessment process.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	**REFERENCE WHERE APPLIED**
• Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued. • Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle. • The participation of all Interested and Affected Parties (I&APs) in environmental governance must be promoted. • Decisions must take into account the interests, needs and values of all I&APs. • The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment. • Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law. • The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage. • The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment. The EIA process to be undertaken in respect of the authorization process of the proposed mining operations is in compliance with the MPRDA, as well as the NEMA read with the Environmental Impact Assessment Regulations of 2014 (as amended). The proposed development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1), the potential consequences for or impacts on the environment of listed activities must be considered, investigated, assessed and reported on to the Minster of Mineral Resources or to the relevant office of the Department responsible for mineral resources, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA.	
GNR 1147 (20 November 2015) of the NEMA - Financial Provisioning Regulations In accordance with the above legislation, the holder of a mining right must make the prescribed financial provision for the costs associated with the undertaking of the management, rehabilitation and remediation of the negative environmental impacts due to prospecting, exploration and mining activities and the latent or residual environmental impacts that may become known in future.	The Final Rehabilitation, Decommissioning and Mine Closure plan will be compiled in accordance with GNR 1147.
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) Previously South African mineral rights were owned either by the State or the private sector. This dual ownership system represented an entry barrier to potential new investors. The current Government's objective is for all mineral rights to be vested	The EIA/EMPr Report was compiled as per the guidelines and requirements of the DMR.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
in the State, with due regard to constitutional ownership rights and security of tenure. The MPRDA was passed in order to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources, and to provide for matters connected therewith. The Preamble to the MPRDA inter alia affirms the State's obligation to: • protect the environment for the benefit of present and future generations; • ensure ecologically sustainable development of mineral and petroleum resources; and • promote economic and social development. The aforesaid preamble affirms the general right to an environment provided for in section 24 of the Constitution (as set out hereinabove). The objects of the MPRDA, as set out in section 2 thereof serve as a guide to the interpretation of the Act. The objects of the MPRDA are as follows: • recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic; • give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources; • promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa; • substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources; • promote economic growth and mineral and petroleum resources development in the Republic; • promote employment and advance the social and economic welfare of all South Africans; • provide for security of tenure in respect of prospecting, exploration, mining and production operations; • give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and • ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating. The national environmental management principles provided for in section 2 of the NEMA apply to all prospecting and mining operations and any matter relating to such operation. These principles apply throughout the Republic to the actions of all organs of state including inter alia the Department of Mineral Resources that may significantly affect the environment.	

<table>
<tr><th>APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT</th><th>REFERENCE WHERE APPLIED</th></tr>
<tr><td>Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations.

Section 38 of the MPRDA states that the holder of inter alia, a prospecting right, mining right or mining permit:
• Must at all times give effect to the general objectives of integrated environmental management laid down in Chapter 5 of NEMA;
• Must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment as contemplated in section 24(7) of NEMA;
• Must manage all environmental impacts –
o In accordance with an environmental management plan or approved environmental management programme, where appropriate, and
o As an integral part of the prospecting or mining operations, unless the Minister directs otherwise.
• Must as far as reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and
• Is responsible for any environmental damage, pollution or ecological degradation as a result of prospecting or mining operations and which may occur inside and outside the boundaries of the area to which such right, permit or permission relates.</td><td></td></tr>
<tr><td>National Water Act, 1998 (Act No. 36 of 1998 (NWA)

In terms of the NWA, the National Government, acting through the Minister of Water Affairs, is the public trustee of South Africa’s water resources, and must ensure that water is protected, used, development, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons (section 3(1)).

In terms of the NWA a person may only use water without a license under certain circumstances. All other use, provided that such use qualifies as a use listed in section 21 of the Act, require a water use license. A person may only use water without a license if such water use is permissible under Schedule 1 (generally domestic type use) if that water use constitutes a continuation of an existing lawful water use (water uses being undertaken prior to the commencement of the NWA, generally in terms of the Water Act of 1956), or if that water use is permissible in terms of a general authorisation issued under section 39 (general authorisations allow for the use of certain section 21 uses provided that the criteria and thresholds described in the</td><td>Tweefontein Section already has a water use licence for the existing activities. A new water use licence will be applied for the Section 21 activities identified as a result of the construction of the new TSF and the associated infrastructures and activities.</td></tr>
</table>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	**REFERENCE WHERE APPLIED**
general authorisation is met). Permissible water use furthermore includes water use authorised by a license issued in terms of the NWA. Section 21 of the NWA indicates that "water use" includes: • taking water from a water resource (section 21(a)); • storing water (section 21(b)); • impeding or diverting the flow of water in a water course (section 21(c)); • engaging in a stream flow reduction activity contemplated in section 36 (section 21(d)); • engaging in a controlled activity which has either been declared as such or is identified in section 37(1) (section 21(e)); • discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit (section 21(f)); • disposing of waste in a manner which may detrimentally impact on a water resource (section21(g); • disposing in any manner of water which contains waste from, or which has heated in, any industrial or power generation process (section 21 (h)); • altering the bed, banks, course or characteristics of a water course (section 21(i)); • removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people (section 21(j)); and • using water for recreational purposes (section 21(k)). In addition to the above and in terms of section 26 of the NWA, Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources were published in GN R. 704 of 4 June 1999 (GN R. 704). The aforesaid GN R. 704 provides for inter alia the capacity requirements of clean and dirty water systems (regulation 6), the protection of water resources by a person in control of a mine (regulation 7), security and addition measures (regulation 8) and temporary or permanent cessation of a mine or activity (regulation 9). According to GN R. 704 "no person in charge of a mine may carry on any underground or opencast mining, prospecting or any other operation or activity under or within the 1:50 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, whichever is the greatest". Insofar as the undertaking of section 21 water uses is concerned, it is anticipated that application for registration and water use licensing will be undertaken.	
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)	An archaeological assessment has been conducted on the

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
The NHRA established the South African Heritage Resources Agency (SAHRA) as well as Provincial Heritage Resources Agencies. In terms of the NHRA, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. No person may damage, disfigure, alter, subdivide or in any other way develop any part of a protected area unless, at least 60 days prior to the initiation of such changes, he/she/it has consulted with the relevant heritage resources authority. Section 34 of the NHRA provides for the protection of immovable property by providing for a prohibition on altering or demolishing any structure or part of any structure, which is older than 60 years, without a permit issued by the relevant provincial heritage resources authority. Accordingly, should the proposed activities, prospecting or mining activities or the closure and rehabilitation of mined land involve the altering or demolishing of any structure or part of any structure, which is older than 60 years, a permit issued by the relevant provincial heritage resources authority is required. No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite; trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. No person may, without a permit issued by SAHRA or a provincial heritage resources authority 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; 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 bring onto or use at the burial ground or grave referred to above any excavation equipment or any equipment which assists in the detection or recovery of metals. Section 38 of the NHRA states that any person who intends to undertake developments categorised in Section 38 of the NHRA must at the very earliest stages of initiating such development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. By way of example, the developments referred to in Section 38 of the NHRA include:	proposed site alternatives for the proposed TSF.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	**REFERENCE WHERE APPLIED**
• the construction of a road, wall, power-line, pipeline, canal or other similar form of linear development or barrier exceeding 300 metres in length; • the construction of a bridge or similar structure exceeding 50 metres in length; • any development or other activity which will change the character of a site as specified in the regulations; • any other category of development provided for in regulations by SAHRA or the provincial heritage resources authority. However, the abovementioned provisions are subject to the exclusion that section 38 does not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act No. 73 of 1989 (EIA) (now presumably the NEMA in view of the repeal of the listed activities under the ECA: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.	
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) The NEMBA aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; 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. The NEMBA provides for the publishing of various lists of species and ecosystems by the Minister of Environmental Affairs and Tourism (now the Minister of Water and Environmental Affairs) as well as by a Member of the Executive Council responsible for the conservation of biodiversity of a province in relation to which certain activities may not be undertaken without a permit. In terms of Section 57 of the NEMBA, no person may carry out any restricted activity involving any species which has been identified by the Minister as "critically endangered species", "endangered species", "vulnerable species" or "protected species" without a permit. The NEMBA defines "restricted activity" in relation to such identified species so as to include, but not limited to, "hunting, catching, capturing, killing, gathering, collecting, plucking, picking parts of, cutting, chopping off, uprooting, damaging, destroying, having in possession, exercising physical control over, moving or translocating".\ The Minister has made regulations in terms of section 97 of the NEMBA with regards to Threatened and Protected Species which came into effect on 1 June 2007. Furthermore, the Minister published lists of critically endangered, endangered, vulnerable and protected species in terms of section 56(1) of the NEMBA.	The legislation was considered throughout the EIA process and in particular the Ecological Impact Assessment which will comply with the NEMBA.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	**REFERENCE WHERE APPLIED**
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA) The NEMAQA came into power on the 24th of February 2005. Additionally, the amendment to the Minimum Emission Standards (GN R 893) also came into effect on the 12 June 2015. This Notice provides a list of activities that may cause atmospheric emissions which have or may have a significant detrimental effect on the environment as well as the minimum emission standards ("MES") for these activities as contemplated in section 21 of NEMAQA. The effect of the commencement of the NEMAQA and the listed activities, listed in GN 964 is that an atmospheric emission licence (AEL) is now required for conducting these listed activities.	Currently there are no listed activities that require registration/permitting according to NEMAQA for the proposed TSF or its associated infrastructures.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA) The NEMWA commenced on 1 July 2009 and as a result of its commencement the relevant provisions in the Environment Conservation Act No. 73 of 1989 (ECA) in respect of waste management, were repealed. The NEMWA sets out to reform the law regulating waste management and deals with waste management and control more comprehensively than was dealt with in the ECA. It also introduces new and distinct concepts never before canvassed within the realm of waste management in South Africa, such as the concept of contaminated land and extended producer responsibility. It also provides for more elaborate definitions to assist in the interpretation of the Act. Section 19 of the NEMWA provides for listed waste management activities and states in terms of section 19(1), the Minister may publish a list of waste management activities that have, or are likely to have a detrimental effect on the environment. Such a list was published in GNR 921 of 29 November 2013. In accordance with section 19(3), the Schedule to GNR 921 provides that a waste management licence is required for those activities listed therein prior to the commencement, undertaking or conducting of same. In addition, GNR 921 differentiates between Category A, B, and Category C waste management activities. Category A waste management activities are those which require the conducting of a basic assessment process as stipulated in the EIA Regulations, 2014 promulgated in terms of the NEMA as part of the waste management licence application and Category B waste management activities are those that require the conducting of a scoping and environmental impact assessment process stipulated in the EIA Regulations, 2014 as part of the waste management licence application. Category C waste management activities do not require a waste management licence, however a person who wished to commence, undertake or conduct a waste management activity listed under this category, must comply with the relevant requirements and standards,	The proposed tailings storage facility (construction and reclamation) requires a waste management licence (WML) as listed in GNR 921 of 29 November 2013 (Category B (11)).

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
Section 20 of the NEMWA pertains to the consequences of listing waste management activities and states that no person my commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required. In terms of the current statutory framework with regards to waste management, a waste management licence is required for those waste management activities identified in the Schedule to GNR 921. Certain of the waste management activities listed in the Schedule are governed by specific thresholds. Where any process or activity falls below or outside the thresholds stipulated, a waste management licence is not required.	
Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA) The LEMA came into effect on 1 May 2004 and aims to consolidate and amend the environmental legislation of or assigned to the Province and to provide doe matters incidental thereto. The objectives of the Act are: (a) to manage and protect the environment in the Province; (b) to secure ecologically sustainable development and responsible use of natural resources in the Province; (c) generally, to contribute to the progressive realisation of the fundamental rights contained in section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996); and (d) to give effect to international agreements effecting environmental management which are binding on the Province	The Ecological assessment as conducted by the specialist included the requirements of this Act into their findings.
Integrated Development Plans and Environmental Management Frameworks	
Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas (OLEMF), December 2009 (Envirometrics and MetroGIS, 2009) The purpose of this EMF is to develop a framework that will integrate policies and frameworks, and align different government mandates in a way that will streamline decision-making to improve cooperative governance and guide future development in an environmentally responsible manner. The objectives of the EMF are to: • encourage sustainable development; • establish development priorities; • identify strategic guidance and development management proposals; • identify the status quo, development pressures and trends in the area; • determine opportunities and constraints; • identify geographical areas in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA); • specify additional activities within identified geographical areas that will require EIA based on the environmental attributes of such areas;	The requirements of the have been assessed and included in the specialist reports and the EIA/EMP.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
• specify currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and • develop a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.	
Greater Sekhukhune District Municipality (DM) 2014/15 Final Integrated Development Programme (FIDP) Review: Greater Tubatse Local Municipality (LM) Draft IDP 2017 – 2018 Legislation was enacted to guide the establishment of and functions of metropolitan, district and local municipalities, including the promulgation of integrated development planning as a tool for development in district and local municipal IDP reports. Section 25 of the Municipal System Act (MSA) requires that an IDP must be compatible with National and Provincial development plans and planning requirements. The above municipalities are characterised by similar developmental constraints highlighted in the Integrated Development Plans for the respective districts: • Large portions of the population reside in rural areas with limited access to opportunities for social and economic upliftment; • Due to its rural nature; the Tubatse Municipality is confronted with a high service delivery backlog. Majority of the settlements are far apart which; makes the provision and maintenance of services very costly. Some of these areas are too small to attain the economic threshold required to provide social facilities in a cost-effective manner. • There are extensive skills shortages in the areas and limited provision of human resource development programmes that would address the skills gap, specifically in the mining sector that is an important revenue generator for both local municipalities; • Existence of large infrastructure backlogs. Together with the identified agriculture and tourism potential, mining is delineated as a priority sector for both municipalities. District municipalities endorse and promote communication and partnerships in the mining industry. It is widely recognised that investment within the mining industry is paramount for the creation of social and economic upliftment within the municipalities.	The proposed development fall under the jurisdiction of the Fetakgomo-Greater Tubatse Local Municipality this is located in the Greater Sekhukhune District Municipality. The need and desirability of the project is in line with the IDP`s of these municipalities.

5. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

5.1. New Activities as Proposed in 2020/2021 Amendment Application

The existing tailings storage facilities are nearing their design capacities thus the need to develop a new residue deposit stockpile area has been identified. Without the capacity to deposit the tailings generated by the operational Tweefontein Section, the section will need to close the Run of Mine (ROM) processing plants as well as the tailings retreatment facility. This will result in the loss of much needed employment positions in the area. This statement is confirmed by the following discussion. The same negative effects are applicable to the Waste Rock Dump (WRD) expansion which is needed for ongoing operations in a safe manner.

5.2. Chrome Mining

Limpopo has rich mineral resources, making mining a critical sector of the economy of the Province, contributing 22% to its Growth Domestic Product (GDP). Unemployment in the region is high with an estimated 42% of the economically active population in the Fetakgomo-Greater Tubatse Local Municipality being unemployed.

Fetakgomo-Greater Tubatse Local Municipality has significant mining in existence and manufacturing (ferrochrome smelters) sectors, but unemployment is still significantly above the provincial average. Further reduction in the unemployment rate will depend on effective intervention by public sector institutions to facilitate economic sector diversification through competitive cluster value-chain development. This implies upstream development in the manufacturing and trade sector to provide essential items in the mining supply chain by local entrepreneurs. It also implies side-stream development in the form of construction and urban renewal. This approach is consistent with the Limpopo Employment Growth and Development Plan (Fetakgomo Greater Tubatse Municipality , 2016).

The economy of the Sekhukhune District is a mixture of very negative features (such as the highest unemployment rate in Limpopo) and very positive opportunities (like the enormous mining potential within the area). The region is also characterised by a weak economic base, poor infrastructure, major service backlogs, dispersed human settlements and high poverty levels.

6. MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE

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

The identification of alternatives is a key aspect of the success of the scoping process and reaches its conclusion in the EIA phase. All reasonable and feasible alternatives was identified and screened to determine the most suitable alternative to consider and assess. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include financial, environmental and social issues, which will be discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location alternatives;
- Process alternatives;
- Technological alternatives; and

- Activity alternatives (including the No-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process. Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

6.1. Details of the Development Footprint Alternatives Considered

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

6.1.1. The property on which or location where it is proposed to undertake the activity

6.1.1.1. Property

The properties on which the proposed TSF and the associated infrastructure will be located are within the Mining Right Area (Figure 2-2) as outlined below:

- Remaining Extent of Mineral Area No. 1 (on Portion 3);
- Remaining Extent of Mineral Area No. 2 (on Portion 4);
- Mineral Area No. 4 (on Portion 4);
- Mineral Area No. 5 (on Portion 3),
- Mineral Area No.6 (on Portion 6);
- Portions 1, 5 and 9 of the Farm Tweefontein 360 KT (but subject to Regulation 17 of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA), excluding any area within 100 metres of any public road, railway, cemetery, residential area or public area).

Samancor is also the surface right holder of these properties and hold the title deeds as indicated below.

Table 6-1: Surface and Chromite rights on the Farm Tweefontein 360 KT applicable to Samancor Chrome Ltd

Title deed number	Portion	Hectares	Rights	Holder
T8269/1993	1	1929.5468	Surface & Chromite	Samancor Chrome Ltd
T54997/1993	3	158.6354	Surface & Chromite	Samancor Chrome Ltd
T54997/1993	4	220.2044	Surface & Chromite	Samancor Chrome Ltd
T21516/2008*	5	316.6699	Surface & Chromite	Samancor Chrome Ltd
T54997/1993	6	414.2632	Surface & Chromite	Samancor Chrome Ltd
T54997/1993	9	14.2338	Surface & Chromite	Samancor Chrome Ltd

The type of minerals mined are chrome (Cr_2O_3), and associated minerals: platinum, palladium, rhodium, ruthenium, iridium and osmium, gold, silver, copper, nickel and cobalt, which may be extracted from normal mining of chromite in the Middle Group (MG) and Lower Group (LG) reefs. Samancor will not be mining the UG2 Reef or the Merensky Reef.

As a result of the above no alternatives with regards to properties were assessed.

6.1.1.2. Activity location alternatives

With regards to the existing operational activities the following is applicable:

- The location of the adits and opencast sections (inclusive of topsoil and overburden stockpiles) as determined by the location of the ore reserve thus no alternatives are applicable.
- Supporting infrastructures are located in areas that are suitable for the use and purpose and location alternatives are evaluated as part of the phased approach of the mine development.

The proposed expansion area of the WRD was determined by the existing footprint area of the WRD and the expansion area is located next to the existing dump. No other alternatives were considered.

With regards to the TSF and associated infrastructure, six (6) different sites were investigated, refer to Figure 6-1. Information was sourced from specialist and the preferred site from an environmental aspect was determined. This was then compared against geotechnical information and undermining of the area where after the assessment was adapted. Two preferred sites were evaluated during the EIA Phase: TWF1 and TWF 3. Of these TWF3 was chosen as the preferred site, please refer to Table 6-2.

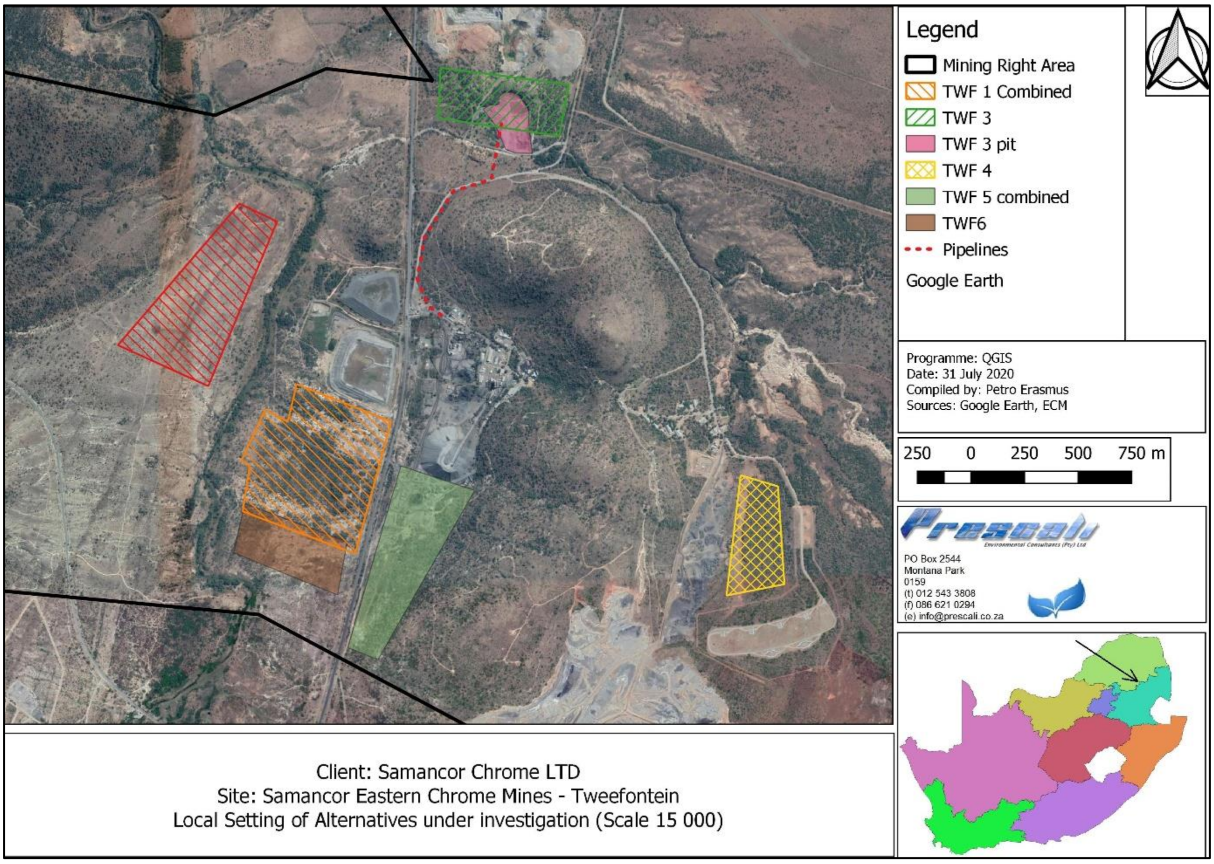


Figure 6-1: Alternative sites investigated for the new TSF

6.1.2. The type of activity to be undertaken

Alternatively to the mining land use the Tweefontein Section mining area could be used for dry land agriculture, residential development and / or wilderness activities.

However, the Tweefontein Section mining right area is currently used for mining related activities as an operational mining area since the 1970's.

The construction of the proposed TSF is required to allow continued processing of the ROM generated by the mining activities and the re-treatment of the tailings. Alternatives assessed with regards to the activity to be undertaken, i.e. specifically with regards to the TSF are:

- Backfilling of existing opencast area with tailings (note that the area identified for the backfilling is already approved by the existing Water Use Licence);

- Construction of a TSF on surface;
- Combination of backfilling of existing opencast areas and surface construction of a TSF.

WRD depositing will continue as per the current method, no alternatives were investigated.

6.1.3. The design or layout of the activity

The final design / layout of the mining activities and support infrastructure are determined by the location of the ore resource and infrastructures to exploit the resource are placed to ensure maximum exploitation without sterilising the resource. As Tweefontein Section is an operational mine, any new infrastructures are planned in accordance with the existing infrastructures on site and layout alternatives are investigated as and when needed in a phased approach. Opencast and underground mining areas are identified based on the presence of the mineral ore and thus no alternatives are applicable regarding this aspect.

The final design of the WRD, TSF and the supporting infrastructure will be prescribed by the final site as selected (TWF3) and will comply with the requirements of the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 as published in Government Notice R632 in Government Gazette 39020 dated 24 July 2015. The design of the new Return Water Dam (RWD) will be compliant with the Requirements of GN704. As a result of the proposed layout for the new TSF and new RWD, a river diversion will be needed.

Table 6-2: Results of the EIA investigation between TWF1 and TWF3

Specialist findings	**Preferred site**	**Additional mitigation measures proposed by Samancor**	**Preferred site following additional measures**
Air quality: Both TWF1 and TWF3 modelling results indicated PM10 levels within prescribed limits. TWF3 had a lower average over all the receptors (EcoElementum Environmental and Engineering, 2020).	TWF3	N/A	TWF3
Archaeological: Three (3) archaeological sites were identified near TWF1 while the TWF3 area has been extensively disturbed and if any sites did exist there in the past it would have been largely disturbed or destroyed as a result (Pelser, A., 2020).	TWF3	N/A	TWF3
Ecological: TWF1 are located on areas that have natural indigenous vegetation and moderate floral diversity. With regards to fauna, TWF1 provides suitable habitat for species of conservation concern. In contrast TWF3 is disturbed and the development may continue without severe ecological impacts in terms of the faunal and floral species (Red Kite Environmental Solutions, 2020).	TWF3	N/A	TWF3
Geohydrological: Modelling indicate that both will impact on groundwater, TWF3 impacts will take longer to reach the Dwars River.	TWF3	Treatment of tailings to bring the waste classification to Type 4 waste.	TWF3
Noise: Modelling results indicated that both TWF1 and TWF3 will result in a low risk of noise impact. However the range of noise generated at TWF3 was less than that of TWF1 (EARES, 2020).	TWF3	N/A	TWF3
Soil: TWF3 is the preferred site as the surface of “high potential” agricultural soil is relatively small and it is has been impacted by historical mining activities. In addition, the potential for soil erosion at TWF3 is less than at TWF1. TWF3 is also further from the perennial Dwars River (ECO Soil, 2020).	TWF3	N/A	TWF3
Surface water: TWF1 is the preferred option due to the fact that it has a lower risk to the downstream water resources especially in terms of seepage that could impact on water quality, habitat and biota. In	TWF1	Treatment of tailings to bring the waste classification to Type 4 waste. This project is still	TWF3

Specialist findings	Preferred site	Additional mitigation measures proposed by Samancor	Preferred site following additional measures
addition, TWF3 may require that the watercourse be diverted again which could result in additional siltation to the downstream water resource (Prescali Environmental Consultants, 2020).		in pre-feasibility phase and a pilot 6 month project is being invetigated. Plume abstraction boreholes located downstream of the backfilled pit. Implementation of a river diversion plan that would result in no erosion of the diverted watercourse banks and capturing of silt at stages in the diverted watercourse.	
Visual: Both sites will have a low to medium impact. *It should be noted that TWF3 is located further from the provincial road which could result in reduced visibility.*	N/A	N/A	TWF3
Socio-Economic (Gudani Consulting, 2021)	N/A	N/A	N/A

6.1.4. The technology to be used in the activity

As part of the TSF design report a comprehensive liner system was design, the assessment considered the Typical Class C liner as prescribed by legislation for landfill sites and an alternative natural liner (Tailings Solutions, 2021). The leakage rate for the Typical Class C liner could be as indicated in Table 6-3.

Table 6-3: Class C liner calculations

Liner seepage evaluation	1st liner	2nd liner (Scenario A)	2nd liner (Scenario B)
No of holes/ha	4	8	8
Dam surface Area (ha)	1	1	1
Average hole diameter (m)	0.003	0.003	0.003
Liquid head (m)	10	5	1
Q (leakage flow rate m3/s)	1.7E-04	3.4E-04	1.1E-04
Q (leakage flow rate m3/day)/ha	14.5	20.5	9.2

The following should be noted about the results indicated in Table 6-3:

- The first and second liners refer to the primary and secondary HDPE liners.
- The first liner would experience a hydrostatic head of 10 m.
- Scenario A: The assumption was made for Scenario A that the holes in the first and second HDPE liners would be directly opposite to each other – thus alignment between all holes. This is a real possibility considering a sharp object on the foundation and the compaction effort associated with the placement of the clay liner. In this case the second hole would experience less than the 10 m static head, say 5.0 m.
- Scenario B: for Scenario B it was considered that the holes of the liners would not be close to each other – thus they would not align. Holes in the second liner would be exposed to a static head of only 1.0 m. However, the assumption is made that there is more holes in the second liner due to construction damage.
- The calculations indicate that a seepage rate between 9.2 and 20.5 m3/day/ha can be expected from the prescribed Class-C liner system.
- It should be noted that the accuracy of calculations is as good as the assumptions made.

The results of the seepage calculations for various layer thicknesses (alternative liner system) are reflected in Table 6-4.

Table 6-4: Modified clay (alternative liner) seepage rates

Description	Quantum
Permeability (m/s)	3.1 x10-9
Layer thickness (m)	0.45
Flow per day (m3/day/ha)	2.68

The following is noteworthy:

- The modelled leakage rates are low - even the leakage rate for a 150 mm thick layer is significantly less than that of the modelled leakage for the prescribed Class C liner.
- Any concern over potential variability in the modified clay properties should be considered and addressed in the selection of a suitable liner thickness.

Based on the differences with regards to seepage rates the alternative liner is the preferred option.

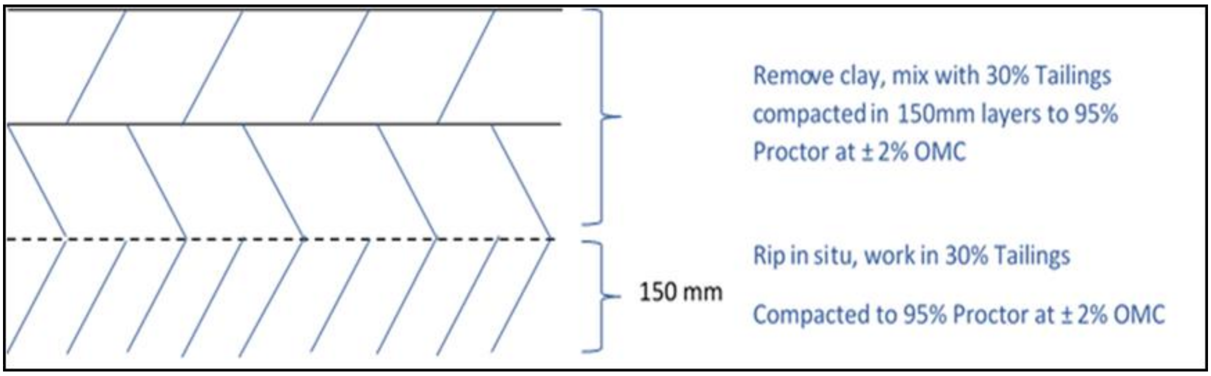


Figure 6-2: Preferred Alternative liner for TSF

6.1.5. The operational aspects of the activity

Tweefontein Section is an operational mine and will remain such until the ore resources are depleted or not financially viable to mine or not possible to mine with current technology.

Operational aspects of the TSF were evaluated during the design of the new TSF (Tailings Solutions, 2021). From the report it was concluded the deposition method of the tailings onto the dam is integral to the final design and layout of the dam thus no alternatives were investigated. The preferred option is using cyclones to deposit the tailings in a cycle method.

6.1.6. The option of not implementing the activity

Tweefontein Section is an operational mine and thus provides much needed employment in the area. The no-go alternative is thus not an option.

The no-go option refers to the alternative of the proposed construction and operation of the TSF (including the reclamation of the TSF) and the expansion of the WRD not going ahead at all. This alternative will avoid potentially positive and negative impacts on the environmental condition of the area where the residue deposit will be constructed.

As indicated the existing residue deposit sites are nearing their design capacity and should the construction, operation and reclamation of the new proposed facility (with associated infrastructure) not go ahead this will result in the loss of existing employment positions and revenue.

7. 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. Summary of issues raised by I&APs

The following process was undertaken to facilitate the public participation process for the proposed opencast project thus far. Please also refer to Appendix 5.

7.1. Notification and Identification of Interested and Affected Parties (I&APs)

7.1.1. Newspaper advertisement

An advertisement notifying the public of the EMPr amendment, Environmental Authorisation, Water Use Licence and Waste Licence applications was published in accordance with regulation 41 (2)(c) and (d) of the EIA Regulation of 2014. The newspaper advertisement was placed as follows:

a) Sekhukhune Times issue of Thursday 06 August 2020.

7.1.2. Site notices and Background Information Document (BID) distribution

In order to inform the surrounding communities and adjacent landowners about the process, Site Notices (in accordance with regulation 41 (2) (c) of the EIA Regulations) were erected at key locations on the 12th August 2020:

Strategic Places	Co-ordinate	
Tweefontein Farm Gate	S24º 53' 33.14" E30º 07' 03.18"	S24.89254º E30.11755º
Vicks Traditional Cooked Meal	S24º 54' 45.65" E30º 06' 39.78"	S24.91268º E30.11105º
Residential Gate (Tree)	S24º 54' 30.17" E30º 06' 49.61"	S24.90838º E30.11378º

To further inform I&APs of the project a Background Information Document (BID) was distributed. The purpose of a BID was to provide stakeholders with introductory information on the applications and the stakeholder engagement process. The BID also provided stakeholders who are interested in the project with the opportunity to register as stakeholders by way of requesting and completing the registration sheet distributed with the BID. Information on the registration sheet has been used to register stakeholders on a database to receive all project-related information and invitations to meetings. The registration sheet included a section for comments and issues, which allows stakeholders an opportunity to provide the consultants with written comments and feedback.

7.1.3. Direct notification of identified I&APs

I&APs were identified through several mechanisms. These include:

- Networking with tribal authorities, non-governmental agencies, community-based organisations, local council representatives, and municipality;
- Advertising in the press, placement of community notices, and distribution of background information documents (discussed separately).

All I&APs identified were registered on the stakeholder database. The public participation consultant endeavoured to ensure that individuals / organisations from referrals and networking were notified of the project, in addition to efforts to notify and identify stakeholders at a geographical level.

Background information documentation was distributed to various stakeholders and I&APs on the 12th August 2020.

Government authority consultation was undertaken as part of the consultation process with I&APs. The following authorities were consulted:

Limpopo Department of Economic Development, Environmental and Tourism (LDEDET)	Draft scoping report submitted for comment Draft EIA_EMPr report submitted for comment
Department of Water Affairs	Meeting held May 2019 Draft scoping report submitted for comment Draft EIA_EMPr report submitted for comment
Fetakgomo-Greater Tubatse Local Municipality	Draft scoping report submitted for comment Draft EIA_EMPr report submitted for comment
Department of Agriculture (DA)	Draft scoping report submitted for comment Draft EIA_EMPr report submitted for comment
National Department of Environmental Affairs (DEA)	Final scoping report submitted for comment Draft EIA_EMPr report submitted for comment
South African Heritage Resource Agency (SAHRA)	Draft scoping report submitted for comment Draft EIA_EMPr report submitted for comment

7.1.4. Continuous communication

Throughout the process the consultant has communicated with registered stakeholders by means of telephone conversations, e-mail correspondences, facsimiles, and registered mail. All comments received through the process were documented in the Issues Register. This method of communication will continue throughout the process until a decision is reached by the relevant authorities.

7.2. Public Meetings

7.2.1. Scoping phase

The following consultation meetings were held:

- Meeting with Magoshi were held on the 15th September 2020, from 10h00 to 11h30 at Winterveld Club.
- Meeting scheduled with various forums could not take place as all members of the community wanted to be in the meeting and the meeting could not take place due to Covid-19 pandemic and subsequent country-wide lockdown. Subject to relaxation of the lockdown conditions and level the requisite public participation meeting will/may be undertaken at a later stage. *To circumvent the requisite public participation meeting, site notices placement within Surrounding Farm Homestead was undertaken on the 12th August 2020 inviting comments and inputs from interested and affected parties.*

7.2.2. EIA Phase

This section will be updated in the final document to reflect meetings held during 2021 once the draft document has been made available for comment.

7.3. Document Review

7.3.1. Draft Scoping Report

The EIA Regulations specify that the Scoping Report must be subjected to a public participation process of at least 30 days. The Scoping Report was made available for a period of 30 days (21 August 2020 – 21 September 2020) to allow for public review and comment as part of the EIA process. The availability of Scoping Report was announced via advertisement, site notices, SMS and notification letters as specified above to all identified and potential I&APs.

In addition, the Scoping Report was distributed for comment as follows:

- Electronic copies were made available via e-mail, on-line file sharing portals and post; and
- Hard or electronic copies of the report were also made available to LEDET, RDLR, DWS, DMR, DAFF, Local Municipality, District Municipality, Limpopo Heritage Agency and the Tribal Authority.

7.3.2. Draft EIA-EMPr

The draft EMPr was made available for a period of 30 days (excluding public holidays) from 30 August 2021 to 30 September 2021 as follows:

- Electronic copies were made available via e-mail, on-line file sharing portals and post; and
- Hard or electronic copies of the report were also made available to LDEDET, RDLR, DWS, DMR, DAFF, Local Municipality, District Municipality, Limpopo Heritage Agency and the Tribal Authority.

7.4. Summary of the Issues Raised by I&APs

(Complete the table summarising comments and issues raised, and reaction to those responses)

Table 7-1: Issues and Responses – Note that this Table will be updated after the EIA phase consultation process for onward submission to the DMR

Interested and Affected Parties		**Date Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were 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.					
AFFECTED PARTIES					
Landowner/s	X				
Thabo Thobejane		27/08/2020	The submission of the EA Application to DMRE Prescali must compile a detailed activity plan which must be shared and sanctioned by Samancor ECM.	Noted	Internal concern – No mitigation needed
Lawful occupier/s of the land					
Landowners or lawful occupiers on adjacent properties	X				
Municipal councillor *Cllr Linky Mariri*	X	15/09/2020	Do the proposed expansion projects fall within the exiting ECM mining footprint.	All the new expansion projects fall within the existing ECM Mining Right area.	No mitigation needed
Municipality	X				
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA e					
Water Affairs	X	7 May 2020	All new water uses (currently existing but not in the existing WULs) triggers new application process in terms of Government Notice Regulation (GNR) 267 published on 24 March 2017 Public participation process as outlined in GNR 267 has to be followed and documents must be clear in terms of what the new application entails	Noted	Part A Section 7 Part B Section 4.8 A water use licence amendment has been applied for – No mitigation needed

Interested and Affected Parties		**Date Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated**
			The minutes of these meeting and the pre-consultation meetings of 2015 will form part of the formal pre-consultations of the new applications Applications will be submitted on Electronic Water Use Licence Application and Authorisation System (EWULAAS) Correction of existing WUL conditions (errors), follows WUL amendment process		
Communities					
Dept. Land Affairs	X				
Traditional Leaders	X				
Kgoputso Segokodi		15/09/2020	What will happen to the cattle grazing within the proposed area?	We will engage with the community/ Moshate to identify a new alternative site. The proposed expansion projects fall within the existing mining right area.	No mitigation needed
David Phurutsi		15/09/2020	You can proceed with the proposed project; kindly send us the presentation report.	Comment noted and the presentations will be sent by email.	N/A
			ECM must take cognizance of any land claims on the affected project areas.	Comment noted and follow-up will be done with the Land Claims Commissioner.	No mitigation needed
Rantho		15/09/2020	The public participation process must include all stakeholders.	The public participation process will include all stakeholders. However, due to Covid-19 ECM	Part A Section 7 No mitigation needed

Interested and Affected Parties		**Date Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated**
				opted to start with the community leaders – Tribal Authorities and Ward	
Dept. Environmental Affairs	X				
MS Mogashoa		23/09/2020	A specialist ecologist must determine if biodiversity offset strategy should be developed considering that some of the proposed sites are already disturbed as indicated in the report. In a case where the offset strategy is necessary the EIA assessment phase must include such a strategy and it must be developed in line with the applicable policies and guidelines and be considered during decision making on this application.	Based on the findings of the specialist assessment a decision will be made if an offset strategy will be required for the preferred site.	No off set strategy was required as the proposed new TSF and the WRD expansion are located within already disturbed areas.
Other Competent Authorities affected	X				
Mapula Sathekge		27/08/2020	Submission of the EA application and the submitted Scoping Report be acknowledged by the DMRE Record of decision from Department of Water Affairs will be required as part the EMPr amendment process and application. She will assist to forward a DWS Checklist which must be complied with.	Noted	Part B Section 4.8 No mitigation needed
OTHER AFFECTED PARTIES					
INTERESTED PARTIES					

8. THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES – BASELINE ENVIRONMENT

8.1. Type of Environment Affected by the Proposed Activity.

(its current geographical, physical, biological, socio-economic, and cultural character)

8.1.1. Regional Location

Tweefontein Section is situated within the jurisdiction of the Greater Tubatse Municipality. The Greater Tubatse Municipality is situated in the Greater Sekhukhune District Municipality within the Limpopo Province. The Greater Tubatse Municipality has 5 towns (0.9% urban) and 166 villages which make up the 99.1 % rural classification (Feta-Kgomo Greater Tubatse Local Municipality, 2018). Please refer to Figure 2-1.

8.1.2. Climate

Steelpoort lies approximately 771 m above sea level and has a climate that is warm and temperate with most of the rain falling during the summer months. The Köppen-Geiger climate classification is Cwa[1].

The average temperature in Steelpoort is 19.9 °C with an annual rainfall of 718 mm[1]. Based on average temperatures January is the warmest month (24.2ºC) and June is the coldest (13.8ºC).

Information sourced from Meteoblue[2] as described below are based on 30 years of hourly weather model simulations that have a spatial resolution of approximately 30 km and may not reproduce all local weather effects, such as thunderstorms, local winds, or tornadoes.

The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month while the "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, Figure 8-1.

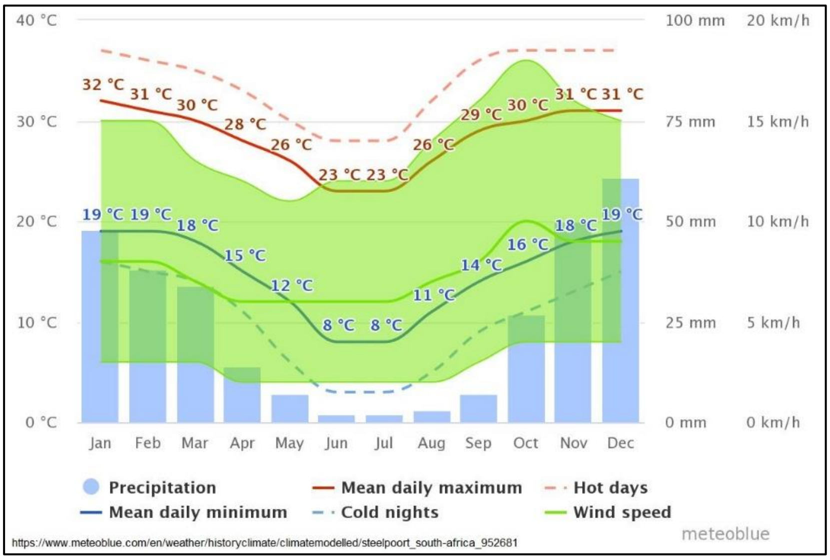


Figure 8-1: Steelpoort Monthly Temperatures, Precipitation and Wind speed[2]

[1] https://en.climate-data.org/africa/south-africa/limpopo/steelpoort-924290/, 20 March 2020
[2] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/steelpoort_south-africa_952681, 20 March 2020

8.1.2.1. Precipitation and Evaporation

From the information from Climate-Data.org the average rainfall figures are provided in Table 8-1. July is the driest month (6 mm) of rain and February the wettest (125 mm) on average. With regards to evaporation, Tweefontein is located within the 2,000 – 2,200 mm A-pan evaporation zone.

Table 8-1: Mean climatic rainfall conditions for the project area[1]

Month	Average Monthly Rainfall (mm)
January	120
February	125
March	78
April	54
May	17
June	10
July	6
August	8
September	23
October	54
November	100
December	123
Annual	*120*

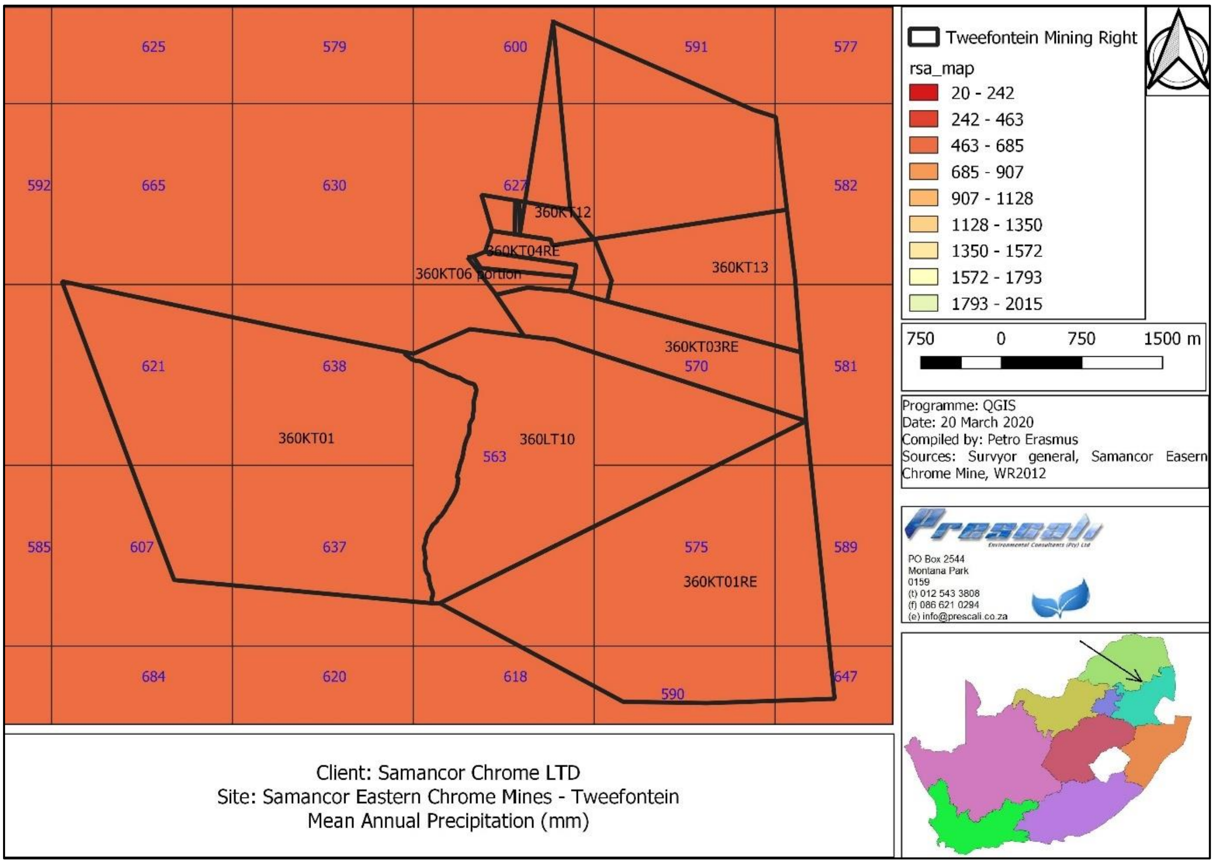


Figure 8-2: Precipitation (mm) for Tweefontein (WR2012)

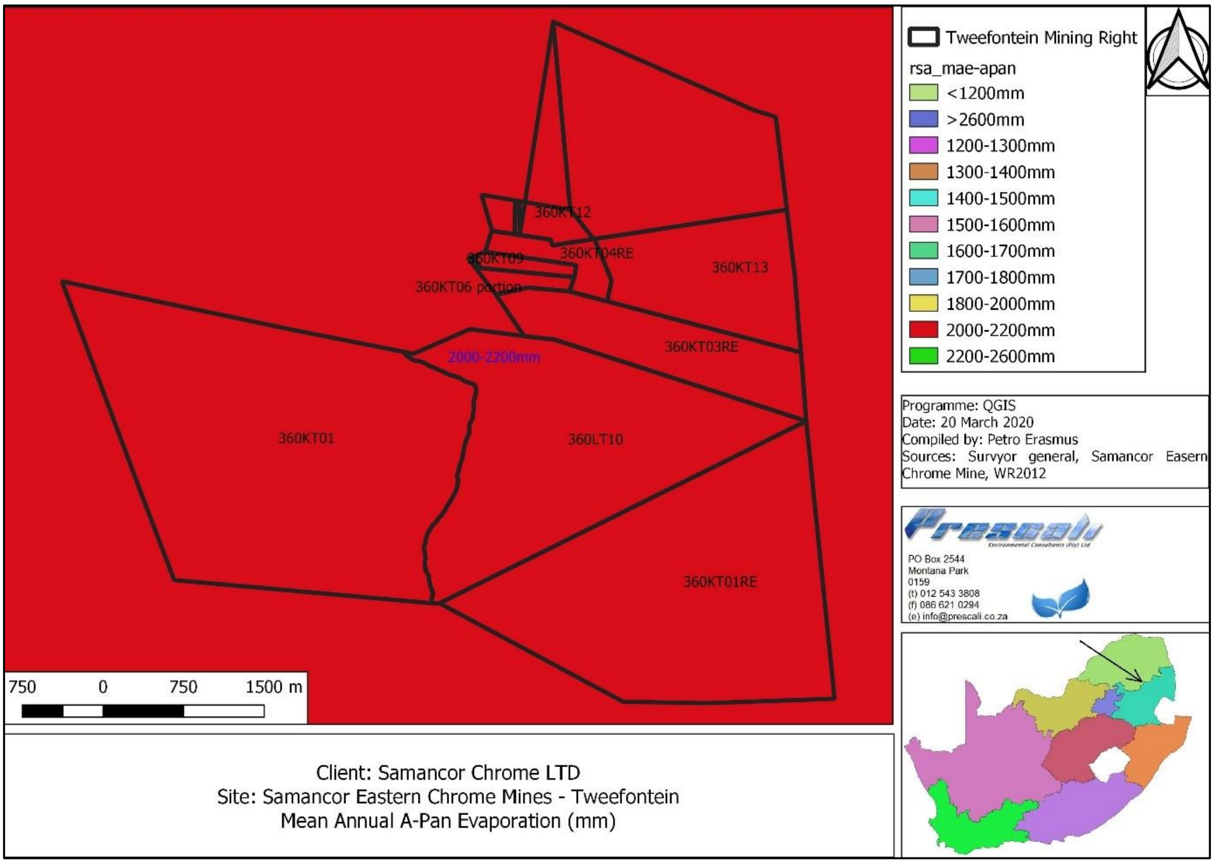


Figure 8-3: A-pan evaporation zone for Tweefontein section (WR2012)

8.1.2.2. Wind

The wind speeds recorded at Steelpoort are indicated in Figure 8-1 and the predominant wind direction is indicated in Figure 8-4. As can be seen the predominant wind direction is from the North-East followed by North-North-East.

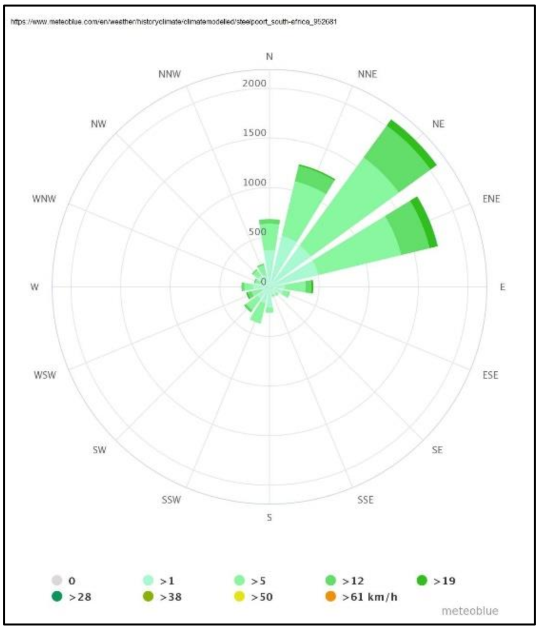


Figure 8-4: Wind direction at Steelpoort[2]

8.1.3. Topography

The topography represents generally mountainous terrain, with broad, flat valleys in between, please refer to Figure 2-2.

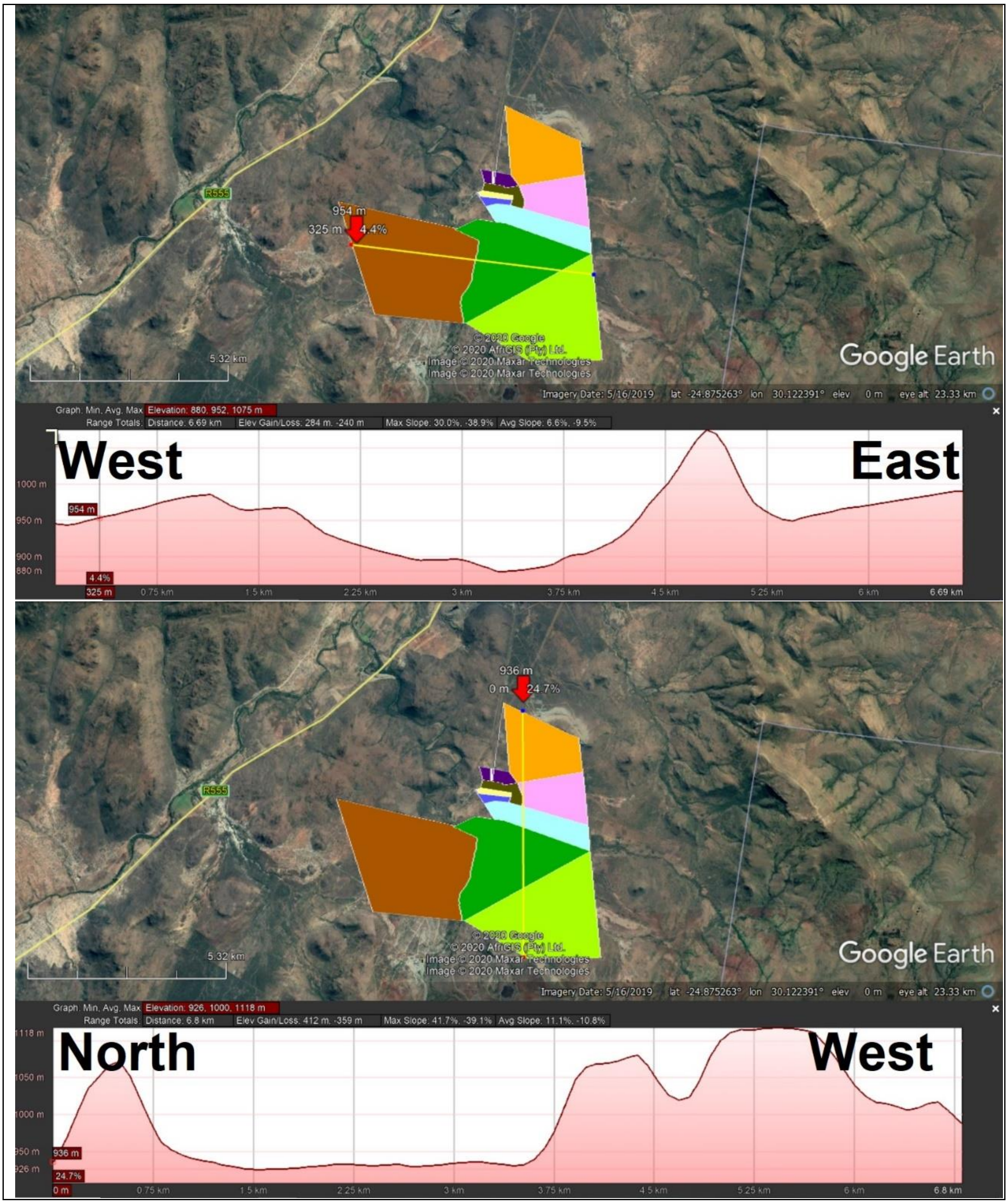


Figure 8-5: Topography at Tweefontein Section

8.1.4. Geology

Information in this section was sourced from the Mine Works Programme as approved by the DMR (Samancor Chrome Ltd, 2018).

8.1.4.1. Regional Geology

Approximately 98% of the world's chrome mineral resources are found within gabbroic layered intrusions of which the Bushveld Complex of South Africa is the largest, measuring 240 by 480 km (Figure 8-6). Gabbroic layered intrusions are mafic to ultramafic plutonic rock bodies. The rock types range from various peridotites towards the base of the intrusion, upward through gabbro and anorthosite, to ferrogabbro and granophyric gabbro at the top. The Bushveld Complex is characterized by an overall mineralogical and chemical gradation from bottom to top of the intrusion.

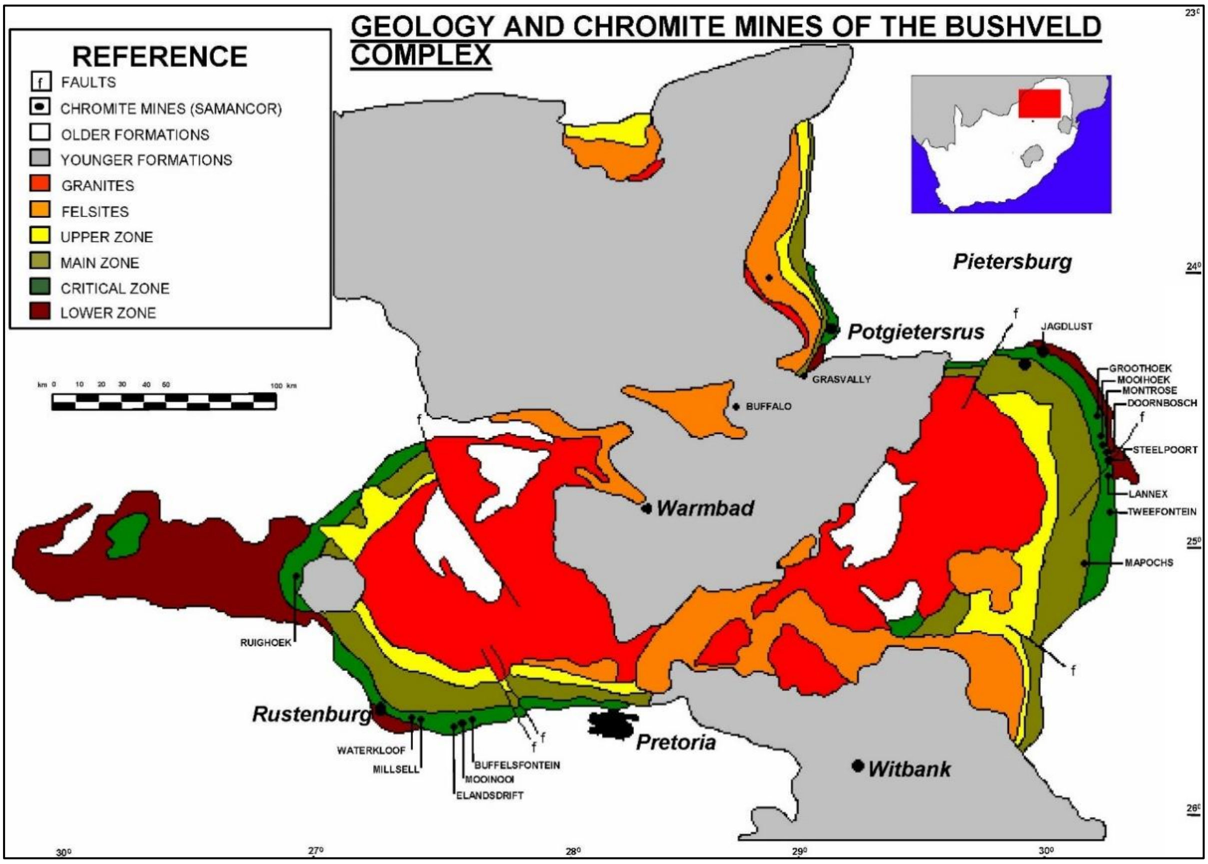


Figure 8-6: Regional Geology

The ECM deposits occur in the Bushveld Complex, which was emplaced into the Kaapvaal Craton between 1 700 and 2 100 million years ago. The lower mafic layered intrusion, the Rustenburg Layered Suite consists stratigraphically of a Marginal Zone, a Lower Zone, a Critical Zone, a Main Zone and an Upper Zone (Figure 8-7).

Chromitite layers occur throughout the Critical Zone and are in turn divided into Lower-, Middle- and Upper Groups. At ECM, chrome ore is being produced from the Lower Group (LG), particularly the LG6- and sometimes also the LG6A chromitite seams at Steelpoort Section, and the Middle Group chromitite (MG), particularly the MG1 chromitite seam at the Tweefontein and Lannex Sections.

The chromitite layers vary in thickness from 2 cm to 2 m and dip towards the centre of the saucer-like structure of the Bushveld Complex. These chromitite layers are remarkably uniform and have been traced for distances of more than 100 km on strike.

Dip angles are typically 10 degrees, but vary between 8 and 14 degrees, depending on the area being mined. Local variations beyond these angles do occur, however, due to rolls in the strata, potholes and large faults. Dip angles at Lannex, situated close to the large Steelpoort Fault, are for instance much steeper. The general dip direction is East-West.

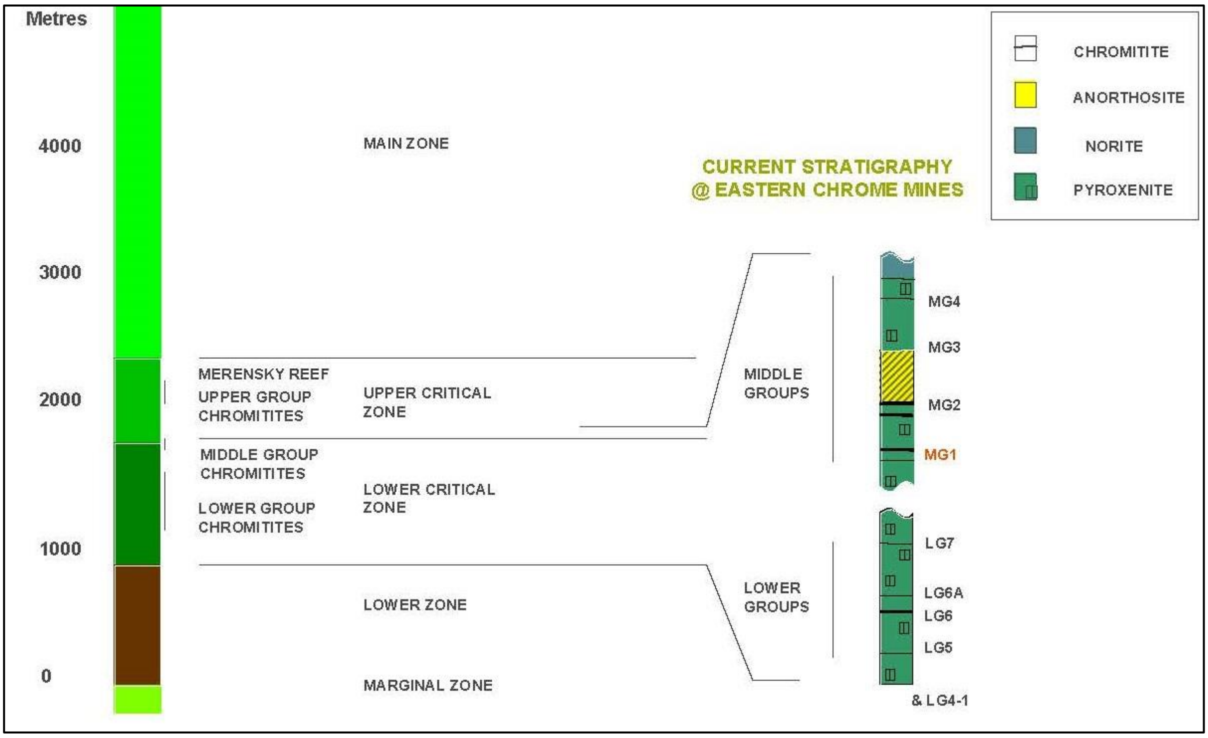


Figure 8-7: Generalised Stratigraphic column

Rock types encountered include anorthosite, norite, pyroxenite and chromitite. The rock type that surrounds the presently mined chromitite seams is pyroxenite. This is typically a very massive rock type, with no typical bedding planes, except for specific layering normally caused by other chromitite layers or stringers and parting planes.

8.1.4.2. Tweefontein Geological Setting

The Middle Group rocks consist of pyroxenite, norite, anorthosite and chromitite layers. Of particular significance is the MG1 chromitite seam, which is being mined at the Tweefontein. Small-scale mining of the MG2 has been carried out in the past, and will be considered for future mining activities.

The MG2 consists of three distinct chromitite layers called A, B and C at the top. The chromitite layers of the MG2 package are separated by pyroxenite partings and disseminated chromitite layers. Figure 8-8 indicates the MG1 chromitite seam is separated from the MG2 chromitite layer above by a pyroxenite parting. An anorthosite layer separates the MG2 and MG3 seams.

Faults usually trend North-East to South-West with downthrown displacements to the South-East. The magnitudes of the displacements increase towards the North-West. Towards the west of Tweefontein the MG1 is found in a series of up thrown blocks. A cross section of the faulted areas is shown in Figure 8-9.

The major dykes are competent and strike in the same direction as the faults, but they usually don't displace the chromitite. Some thin "soft" dykes strike in an east-west direction.

The dominant joint set trends roughly on strike.

The immediate hanging wall of the MG1 consists of a 20 cm pyroxenite layer capped by a 5cm disseminated chromitite layer. This layer forms a potentially weak beam, which could become unstable if not supported properly. However, it is practice to remove the thin beam as part of the mining activities.

A thin chromitite stringer exists about 6 m above the MG1 seam, within the MG1/MG2 pyroxenite parting.

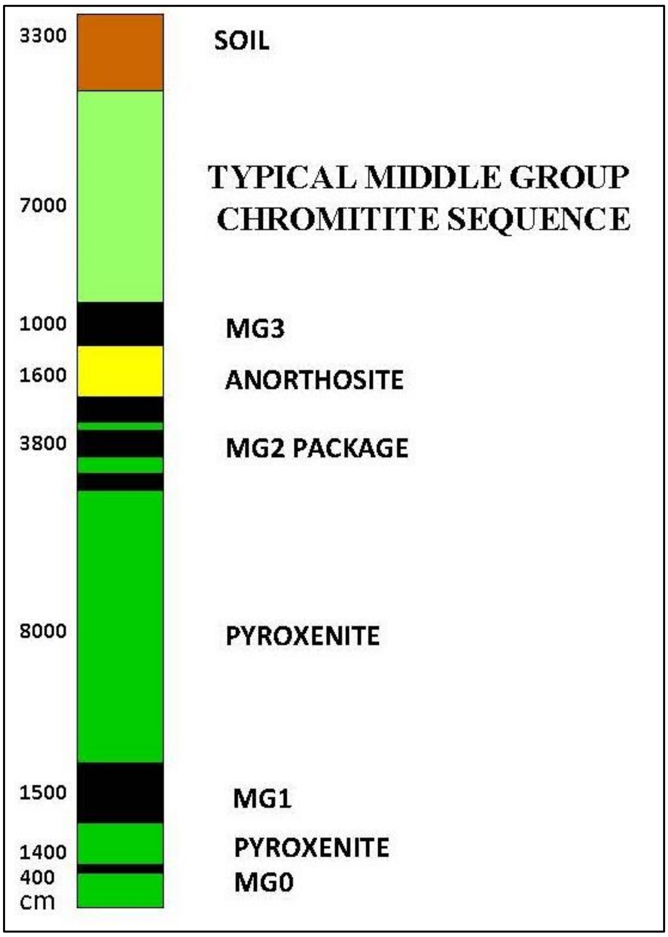


Figure 8-8: Detailed stratigraphic column at Tweefontein section

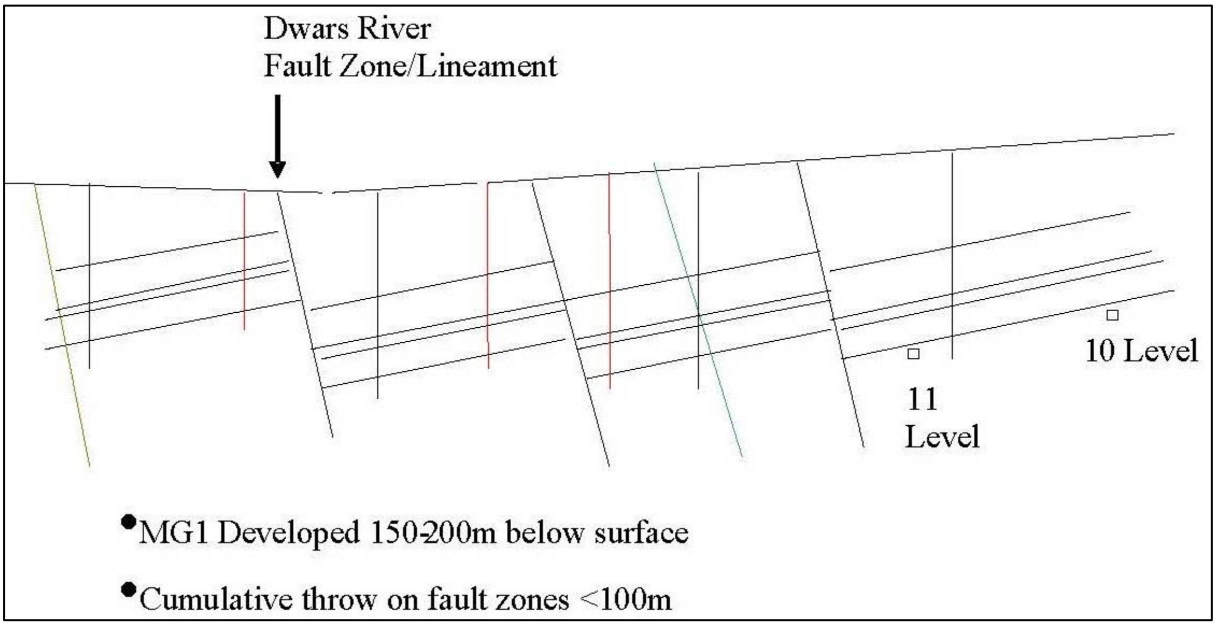


Figure 8-9: Schematic dip section through Tweefontein

The chromitite seam is affected in the south east of the section by pegmatite intrusions. These intrusions normally cause an increase in stoping width and potentially unstable ground conditions. Variability in the position and thickness of the pegmatite intrusions complicates mining of the MG1 in this area.

8.1.5. Agricultural, Soil and Land Capability

8.1.5.1. Land types

A land type unit is a unique combination of soil pattern, terrain and macroclimate, the classification of which is used to determine the potential agricultural value of soils in an area. The land type unit represented at Tweefontein include the Dc31 and IB192 land types (ENPAT, 2001 as referenced by ECO Soil, 2020). The land type, geology and associated soil types is presented in Table 8-2 below as classified by the Environmental Potential Atlas, South Africa (FIDP2001 as reference by ECO Soil, 2020). This was confirmed by assessment done in 2020 for the areas under investigation as part of the EMPr amendment (i.e. new TSF and WRD expansion) (ECO Soil, 2020). From the 2020 specialist report it was determined that Dc31 covers 14,353 ha.

Table 8-2: Land types, geology and dominant soil types at Tweefontein Section (ENPAT, 2001) (ECO Soil, 2020)

Land type	Soils	Geology
Dc31 (freely drained, structured soils)	Prismacutani and/or pedocutanic diagnostic horizons dominant. In addition, one or more of: vertic, melanic, res structured diagnostic horizons.	Norite and Gabbro of the Rustenburg Layered Suite, Bushveld complex.
Ib192 (non soil land classes)	Miscellaneous land classes, rocky areas with miscellaneous soils.	Transvaal Sequence. Norite, pyroxenite and andesite of the Dwars River Subsuite; bronzitite, harzburgite and norite of the Croydon Subsuite; hornfels of the Vermont Formation.

8.1.5.2. Soil

From the 2002 EMPr the soil at the underground Tweefontein Section where most of the surface infrastructure is located are described as general debris and bedrock in an undulating area. The area can be classified as “Tacky outcrops, lithosols and steep inclines” and natural erosion has scarred the natural drainage pattern, due to excessive runoff.

The dominant soil around Tweefontein Section (as per the 2006 EMPr amendment), according to the Taxonomical Soil Classification System of South Africa, is a Mispah soil characterised by a low clay content orthic A-Horizon overlying rock. The effective average depth of the Mispah soil is 150 mm. The agricultural potential of the soil is considered low under dryland (>650 mm/y rainfall) and irrigation.

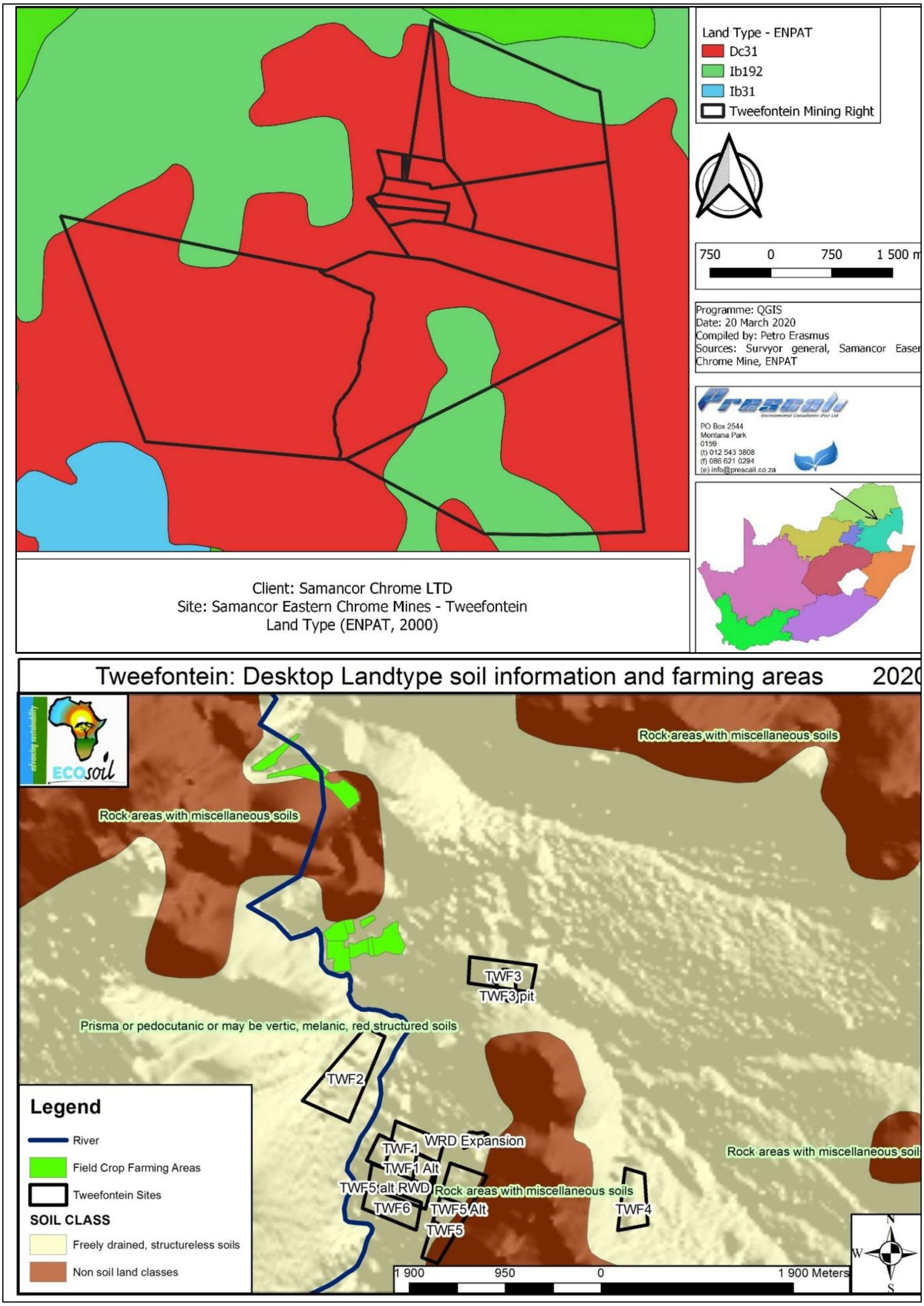


Figure 8-10: Land Type at Tweefontein (ENPAT, 2001) (ECO Soil, 2020)

From then 2020 assessment (ECO Soil, 2020) soil types specific to the proposed TSF sites and WRD expansion were determined as follows:

- Addo-Ad (Orthic A / neocarbonate B / soft carbonate B. The B-horizon has non-homogeneous colours and its aggregation is weaker than moderately structured. This soil form has undergone pedogenesis and contains Ca or Ca-Mg carbonate in the soil matrix of the B-horizon. It reflects specific climatic (usually arid to semi-arid regions) and topographic environments in which the leaching potential is limited. The parent material is rich in divalent base cations.
- Augrabies-Au (Orthic A / neocarbonate B / unspecified: The B-horizon has non-homogeneous colours and its aggregation is weaker than moderately structured. This soil form has undergone pedogenesis and contains Ca or Ca-Mg carbonate in the soil matrix of the B-horizon. It reflects specific climatic (usually arid to semi-arid regions) and topographic environments in which the leaching potential is limited. The parent material is rich in divalent base cations.
- Coega-Cg (Coega-Cg (Orthic A / hardpan carbonate horizon): It is a shallow soil, generally approximately 30 cm deep, on a lime-cemented calcium carbonate hard bank.
- Glenrosa-Gs (Orthic A / lithocutanic B): The Glenrosa is generally a shallow soil and the underlying material in this case is lithocutanic, which is a tonguing soil/saprolite transition. The tongues penetrate the saprolite and are therefore not continuous. It gradually changes to fractured rock and then to hard rock.
- Mispah-Ms (Orthic A / hard rock): The Mispah is generally a shallow soil and the underlying material in this case is a continuous hard layer of rock. It cannot be cut with a spade when wet.
- Oakleaf-Oa (Orthic A / neocutanic B / unspecified material): The B-horizon has non-homogeneous colours. Its aggregation is weaker than moderately structured, developed from unconsolidated material and is non-calcareous. The sub-soil shows no signs of wetness. The underlying material is unspecified (but should be specified by the surveyor).
- Witbank-Wb (Orthic A / Man made soil deposit): The Witbank soil form is man-made materials with or without rock fragments or man-made materials. The soils have not undergone pedogenesis and do not have recognizable diagnostic soil horizons.

Historically the soil depth would have ranged between 50 to 70 cm but due to erosion the current soil depth is not deeper than 30 cm (ECO Soil, 2020). Clay content of soil is approximately 18 to 20% in the topsoil and 35 to 40 % in the subsoil.

8.1.5.3. Land capability

From the 2020 assessment (ECO Soil, 2020) the soils at Tweefontein Section was found to be Class VII and VIII based on the Klingbiel and Montgomery classification. This means that there are severe limitations making it unsuitable for cultivation and proposed use is restricted to grazing, woodland or wildlife.

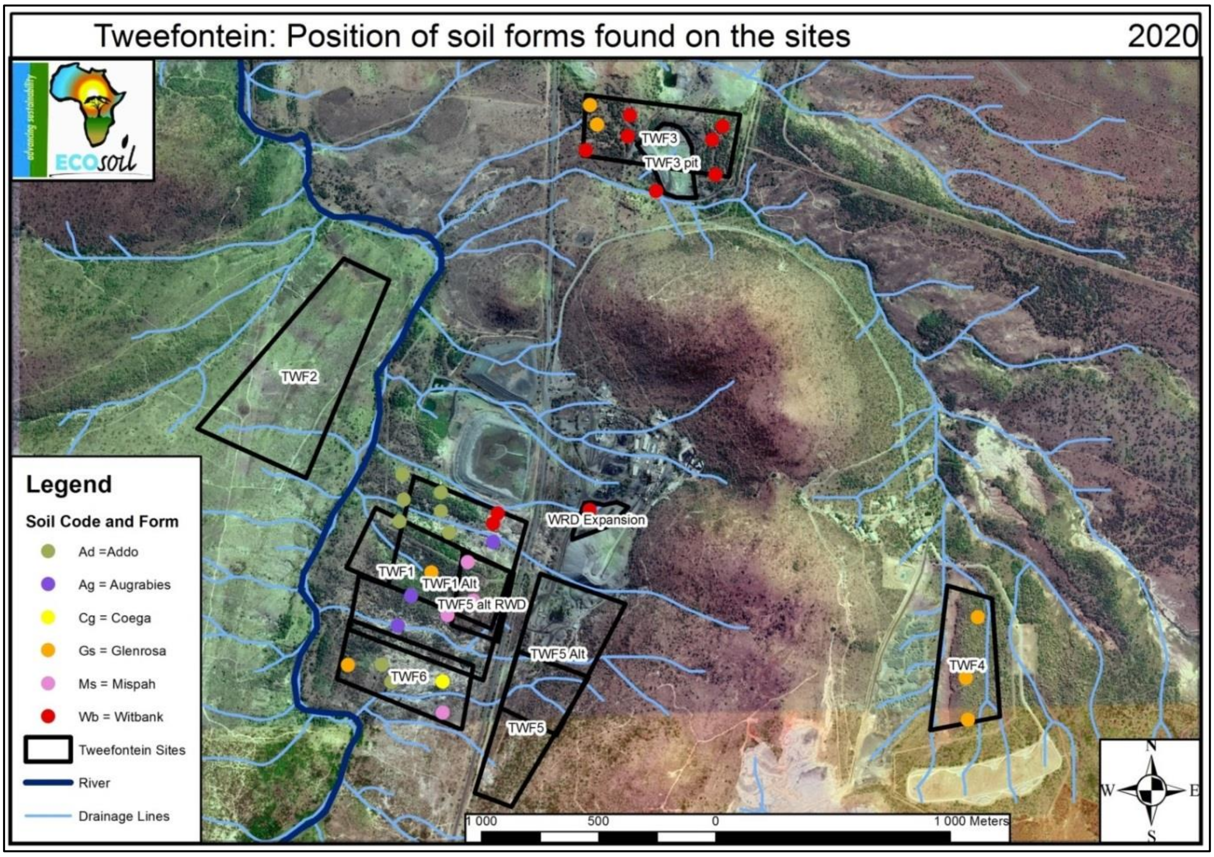


Figure 8-11: Position of soil forms identified at the 2020 expansion activities

8.1.6. Biodiversity

8.1.6.1. Vegetation

Tweefontein Section is located within the Savanna Biome which covers 34.3% of the RSA with more than 5,700 plant species occurring.

Historically, (from the 2002 EMPr) the vegetation has been classified as “Mixed Bushveld” and the vegetation appears as open savannah on deep soil; which tends to thicken along river valleys. The amendment conducted in 2006 to include the Klarinet opencast),extrapolated and confirmed the vegetation type as Veld Type 18, Mixed Bushveld, Variation (e) *Acacia nigrescens (Senegalia nigrescens) - Combretum apiculatum - Kirkia wilmsii* Veld (Acocks, J.P.H, 1975).

Following the latest classification (Red Kite Environmental Solutions, 2020) based on the National Vegetation Map of 2018 , Tweefontein is located within the Sekhukhune Mountain Bushveld vegetation type which is characterised by dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the northeastern escarpment. Dry habitats contain a number of species with xerophytic adaptations, such as succulence and underground storage organs. It is important to note that Tweefontein Section is also located within the Sekhukhune Centre of Endemism and should be considered as sensitive. The expansion sites were evaluated and four (4) vegetation units were identified:

- Moderately disturbed bushveld (VU1);
- Highly disturbed bushveld (VU2);
- Watercourses and riparian bushveld (VU3); and
- Degraded and transformed areas (VU4).

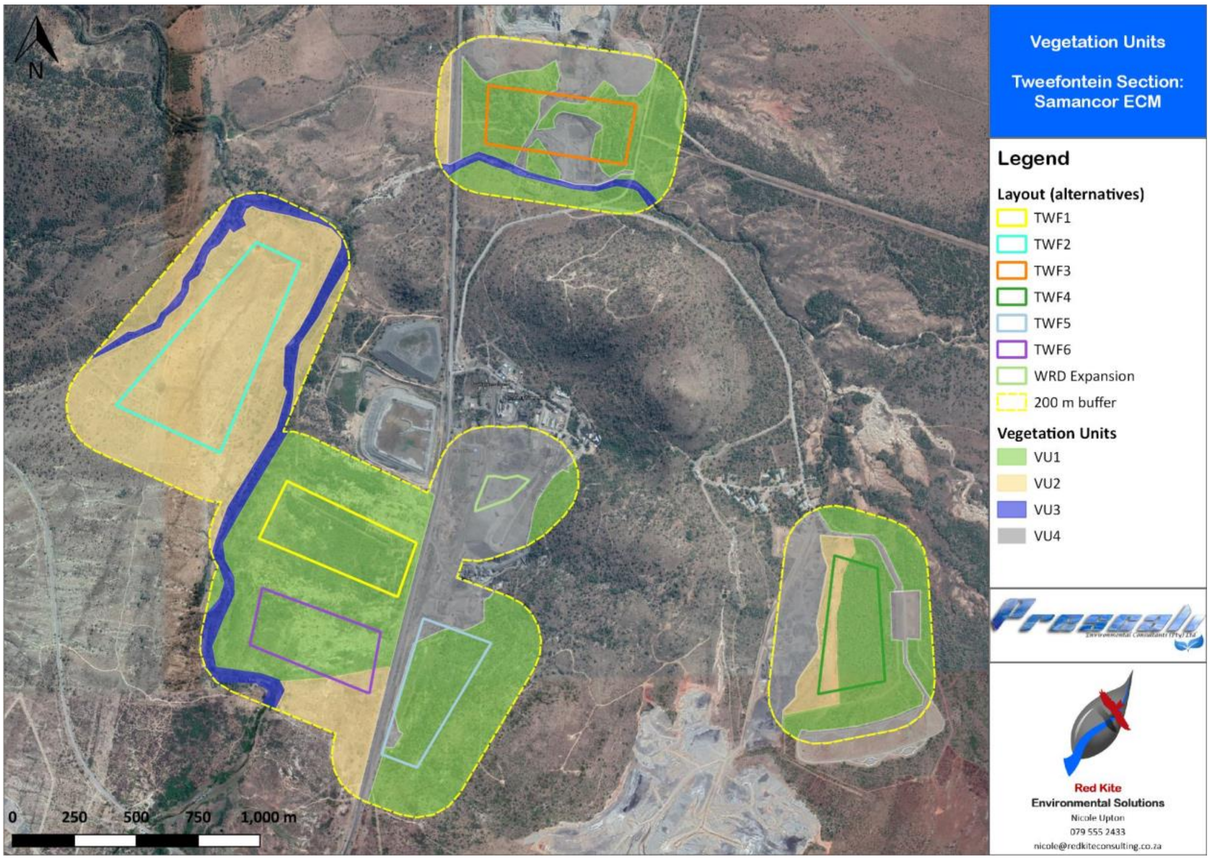


Figure 8-12: Vegetation units for the 2020 expansion areas

The area was and is covered by open woodland on a west facing slope on rocky soils. Vegetation recorded on site (historically+ and as per the 2020 assessment*)) were:

Species	Common name	Comment
*Acokanthera oppositifolia**	Bushman's poisontree	Medicinal
*Aloe castanea**	Cat's tail aloe	
*Aloe spicata**	Lebombo aloe	LEMA: Protected
*Aristida adscensionis**	Annual three-awn	
*Aristida bipartite**	Rolling grass	
Aristida canescens+	Pale three awn	
*Aristida rhiniochloa**	Rough three-awn	
Aristida stipitata+	N/A	
Aristidia congesta, susp. *Barbicolli+*	Buffalo grass	
*Asparagus laricinus**	Bergkatbos	
*Berchemia zeyheri**	Red ivory	
*Bidens pilosa**	Common blackjack	
*Boscia foetida**	Smelly shepherd's bush	
*Bothriochloa insculpta**	Pinhole grass	
Brachylaena ilicifolia+	Small-leaved Silver-oak	
Burkea Africana+	Wild syringa	
*Carissa bispinosa**	Lowveld numnum	Medicinal
Cenchrus ciliaris+*	Blue buffalo grass / Foxtail buffalo grass	
*Cereus jamacaru**	Queen of the night	AIP 1b
*Cleome angustifolia**	Yellow mouse-whiskers	
Combretum apiculatum+	Red bushwillow	

Species	Common name	Comment
Combretum hereroense+*	Moused eared bushwillow	Medicinal
*Commiphora mollis**	Velvet corkwood	
*Crotalaria monteiroi**		
*Croton gratissimus**	Lavender feverberry	Medicinal
*Cussonia paniculata**	Karoo cabbagetree	
Cymbopogon pospischillii+	N/A	
*Cyperus sexangularis**	Matjiesgoed	
*Dichrostachys cinerea**	Sickle bush	
*Dicoma anomala**	Maagbitterwortel	Medicinal
Dicrostachys cinereal+	Sickle Busch	
*Digitaria eriantha+**	Digitgrass / Pangola-grass	
*Diheteropogon amplectens**	Broad-leaved bluestem	
*Dodonaea viscosa**	Sandolive	Medicinal
*Ekebergia capensis**	Cape-ash	Medicinal
*Elaeodendron transvaalense**	Bushveld saffron	Medicinal; NFA Protected
*Elephantorrhiza praetermissa**	Sekhukhune elephant-root	Medicinal; LEMA: Protected
Elephatorrhiza burkei +	Elephant Root	
*Enneapogon scoparius+**	Bottlebrush Grass	
*Eragrostis cylindriflora**	Blousaadgras	
*Eragrostis inamoena**	Tite grass	
*Eragrostis superba**	Saw-tooth love grass	Facultative wetland species
*Euclea crispa**	Blue guarri	Medicinal
Euclea linearis+	Lance-leaved Guarri	
*Euclea undulata**	Common guarri	Medicinal
*Euphorbia schinzii**	Klipmelkbossie	
*Euphorbia tirucalli**	Rubber euphorbia	
Ficus sur +	Cape Fig	
*Fingerhuthia Africana+**	Thimble grass	
*Grewia flava**	Donkeyberry	
*Grewia occidentalis**	Crossberry	Medicinal
*Gymnosporia senegalensis**	Confetti spikethorn	Medicinal
*Heteropogon contortus**	Spear grass	
*Hibiscus cannabinus**	Wild stockrose	Exotic
*Hippobromus pauciflorus**	False-horsewood	Medicinal
*Hyparrhenia tamba**	Blue thatching grass	Facultative wetland species
*Imperata cylindrical**	Cotton wool grass	Obligate wetland species
*Justicia protracta**	Veld justicia	
*Kalanchoe luciae**	Northern white lady	
*Kirkia wilmsii+**	Mountain Seringa	
*Loudetia simplex+**	Russet Grass	Facultative wetland species
*Lydenburgia cassinoides**	Sekhukhune bushman's tea	Medicinal; NFA Protected
*Melia azedarach**	Syringa	AIP 1b
*Melinis repens**	Natal red-top	
*Mimusops zeyheri**	Moepel	

Species	Common name	Comment
Ochna pulchra+	Lekker breek	
*Opuntia ficus-indica**	Sweet prickly pear	AIP 1b; Medicinal
*Panicum maximum**	White buffalo grass	
Pavetta zeyheri+	Brides Bush	
*Peltophorum africanum**	African wattle	Medicinal
Petalidium oblongifolium+	Bloubos / blou tong klapper	
*Phragmites australis**	Common reed	Obligate Wetland species
*Phragmites mauritianus**	Steekriet	
*Pittosporum viridiflorum**	Cheesewood	Medicinal; NFA Protected
*Psiadia punctulata+**	Sticky psiadia	
Rhoicissus tridentate+	Wild grape	
*Rhoicussus sekhukhuniensis**	Sekhukhune grape	
*Rhynchosia nitens**	Vaalboontjie	
*Sansevieria hyacinthoides**	Mother-in-law's tongue	
*Schizachyrium sanguineum**	Red Autumn grass	
*Sclerocarya birrea**	Marula	Medicinal; NFA Protected
Searsia keettii+*	Slender karee	
*Searsia leptodictya**	Mountain karee	
*Searsia pyroides**	Firethorn crowberry	Medicinal
Senegalia caffra+	Common Hook-thorn	
*Senegalia erubescens**	Blue thorn	
Senegalia Senegal+	Gum Accacia	
*Senna occidentalis**	Stinking weed	AIP 1b
*Setaria sphacelata **	Bristle grass	Facultative wetland species
*Setaria verticillata**	Bur bristle grass	
*Sporobolus africanus**	Rat’s tail dropseed	Facultative wetland species
*Stipagrostis hirtigluma**	Blue bushman’s grass	
Stipagrostis uniplumis+	Bushman Grass	
*Tagetes minuta**	Tall khaki weed	Exotic
Tarchonathus camphoratus +	Camphor bush	
*Terminalia prunioides**	Purplepod clusterleave	
Terminalia serices+	Clusterleaf	
*Themeda triandra+**	Red grass	
*Tinnea rhodesiana**	Brown tinnea	
Triaspis glaucophylla +	Blue-leaved Saucer-fruit	
*Urochloa mosambicensis**	Bushveld signal grass	
*Vachellia karoo**	Sweet thorn	
*Vachellia nilotica**	Scented-pod	Medicinal
*Vachellia robusta**	Robust thorn	
*Vernonia fastigiata**	Narrow-leaved vernonia	
Vitex rehamannii+	Pipe-stem fingerleaf	
*Xanthium strumarium**	Large cocklebur	AIP 1b
*Xerophyta retinervis**	Black-stick lily	Medicinal
Ziziphus mucronata +	Buffalo thorn	Medicinal

8.1.6.2. Fauna

All fauna species that occur in the applicable Quaternary Degree Square 2430 CC are listed in the 2020 specialist report Appendix D (Red Kite Environmental Solutions, 2020) and from these the following are deemed relevant to Tweefontein Section:

Common name	Species	Conservation status
Mammalian species		
Leopard	*Panthera pardus*	Vulnerable (2016) – Not expected on final alternatives due to proximity of current developments
Reptilian species		
FitzSimons' Flat Lizard	*Platysaurus orientalis fitzsimonsi*	Near Threatened (SARCA 2014)
Avifaunal species		
Falcon, Lanner	*Falco biarmicus*	VU (Regional), LC (Global)
Kingfisher, Half-collared	*Alcedo semitorquata*	NT (Regional), LC (Global)
Stork, Abdim's	*Ciconia abdimii*	NT (Regional), LC (Global)
Vulture, Cape	*Gyps coprotheres*	EN (Regional), EN (Global), VU (TOPS 2013)

Limited numbers of baboons, monkeys, small antelope species and a large variety of bird species and reports of sighting of leopards have been received (2006 EMPr). During the specialist study conducted in 2006 only one mammal (Scrub hare, *Lepus saxatilis*) and one lizard (Variable Skink, *Rachylepis varia*) was seen. Fauna species recorded during the 2020 assessment were:

Family	Species	Common Name	Sighting/Finding	Status and IUCN
Invertebrates and Butterflies				
Tenebrionidae	*Zophosis testudinaria*	Frantic tortoise Beetle (Koffie-pit)	Sightings	Least Concern
Bolboceratidae	*Meridiobolbus sp - likley Meridiobolbus faustus*	Dor Beetles	Sighting	Least Concern
Pyrrhocoridae	*Dysdercus nigrofasciatus*	Cotton Stainer	Sighting	Least Concern
Pyrgomorphidae	*Phymateus morbillosus*	Milkweed Locust	Sighting	Least Concern
Mantidae	*Episcopomantis chalybea*	Grass Mantis	Sightings	Least Concern
Pamphagidae	*Hoplolopha* sp.	Saw-backed locust	Sightings	Least Concern
Pisauridae	*Perenethis simoni*	Nursery web spider	Sightings	Least Concern
Araneidae	*Gasteracantha versicolor*	Long-winged kite spider	Sightings	Least Concern
Araneidae	*Argiope australis*	Garden orb spider	Sightings	Least Concern
Agelenidae	Species unknown	Funnel-web spiders	Sightings	Least Concern
Nymphalidae - Satyrinae	*Bicyclus safitza*	Common Bush Brown	Sightings	Least Concern
Pieridae	*Colotis eris*	Banded Gold Tip	Sightings	Least Concern
Pieridae	*Belenois aurota*	Brown-veined white	Sightings	Least Concern
Nymphalidae	*Byblia ilithyia*	Spotted Joker	Sighting	Least Concern
Nymphalidae	*Danaus chrysippus*	African Monarch	Sighting	Least Concern
Nymphalidae	*Junonia hierta*	Yellow Pansy	Sightings	Least Concern
Reptiles				
No reptile species observed				
Amphibian				

Family	Species	Common Name	Sighting/Finding	Status and IUCN
No amphibian species observed				
Mammalians				
Cercopithecidae	*Papio ursinus*	Chacma baboon	Sightings in area	Least Concern (2016) Schedule 8 LEMA
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet monkey	Sightings in area	Least Concern (2016) Schedule 8 LEMA
Leporidae	*Lepus saxatilis*	Scrub hare	Sightings at TSF1 and TSF3	Least Concern (2016) Schedule 4 LEMA (Game)
Hystricidae	*Hystrix africaeaustralis*	Cape porcupine	Sighting of quills at TSF1	Least Concern (2016)
Bovidae	*Sylvicapra grimmia*	Grey duiker	Tracks and signs at TSF1	Least Concern (2016) Schedule 4 LEMA (Game)
Bovidae	*Raphicerus campestris*	Steenbok	Dung at TSF1	Least Concern (2016) Schedule 3 LEMA (Protected Wild Animals)
Avifaunal				
Turnicidae	*Turnix sylvaticus*	Common buttonquail	Sightings	Least Concern
Estrildidae	*Estrilda astrild*	Common waxbill	Sightings	Least Concern
Ploceidae	*Euplectes albonotatus*	Widowbird White-winged	Sightings	Least Concern
Numididae	*Numida meleagris*	Helmeted guineafowl	Feathers, Sightings	Least Concern
Ploceidae	*Plocepasser mahali*	White browed sparrow-weaver	Sightings	Least Concern
Alaudidae	*Eremopterix leucotis*	Chestnut-backed sparrow-lark	Sightings	Least Concern
Viduidae	*Vidua funerea*	Dusky Indigobird	Sightings	Least Concern
Leiothrichidae	*Turdoides bicolor*	Southern Pied Babbler	Sighting	Least Concern
Cuculidae	*Centropus burchelli*	Burchell's Coucal	Sightings	Least Concern
Upupidae	*Upupa africana*	Hoopoe, African	Sightings	Least Concern
Hirundinidae	*Riparia cincta*	Martin, Banded	Sighted	Least Concern
Ploceidae	*Ploceus intermedius*	Lesser masked weaver	Sighted	Least Concern
Ploceidae	*Euplectes afer*	Yellow-crowned bishop	Sighted	Least Concern
Ploceidae	*Euplectes orix*	Red bishop	Sighted	Least Concern

8.1.7. Surface Water

The Tweefontein Section is located within the Olifants River Water Management Area (WMA) (B4 Primary catchment), specifically quaternary catchment B41H in the Steelpoort sub-WMA (Figure 8-13). Various ephemeral drainage lines cross the Tweefontein Section to join the Dwars River and one of these has been diverted around a historic opencast section for which Tweefontein Section has a water use licence to backfill with tailings. The Tweefontein Section water use licence also authorised impacts on other tributaries as a result of the opencast activities at Klarinet.

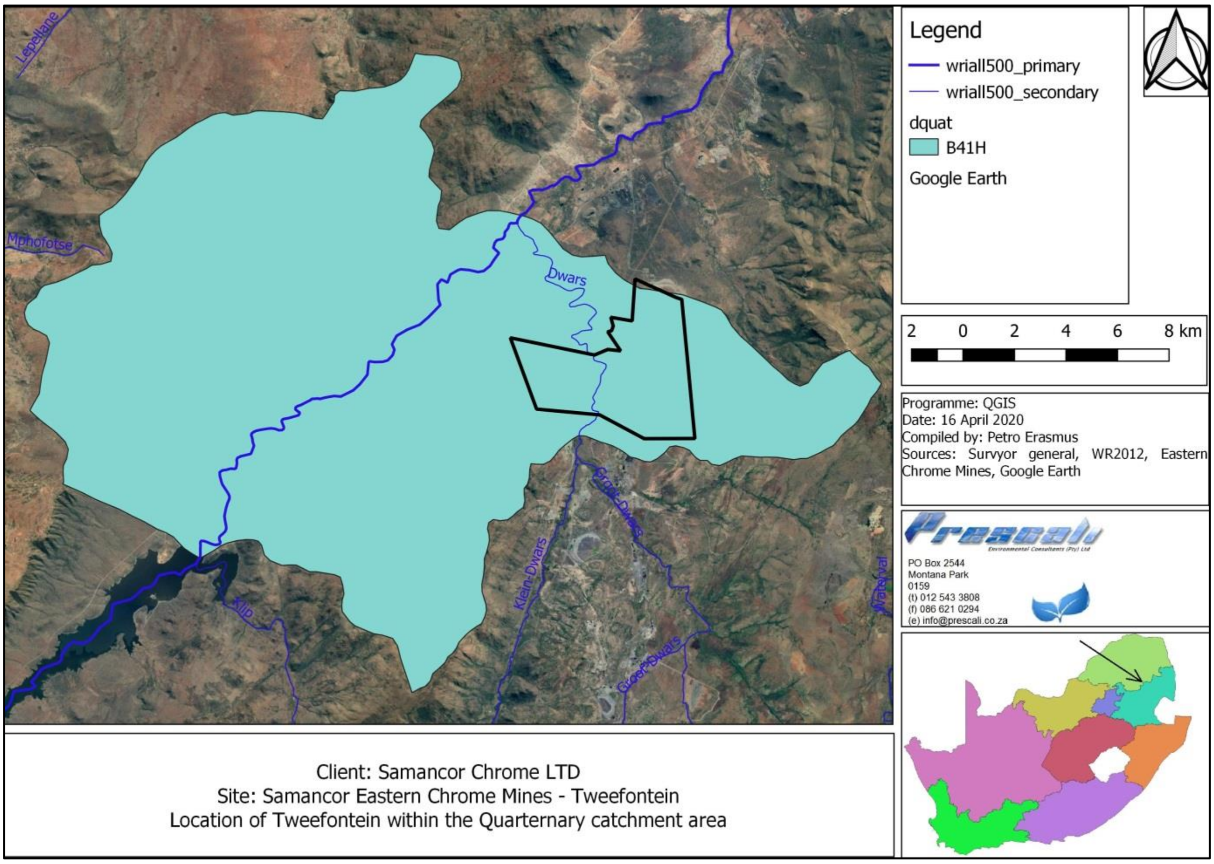


Figure 8-13: Location of Tweefontein Section within the quaternary drainage area

There are thus two main water resources traversing the Tweefontein Section mining right area. These water courses are unnamed and have been impacted by the existing mining activities already. The first tributary is located at the Tweefontein mining area (referenced as Tributary 1) and the other is located at the Klarinet mining area (referenced as Tributary 2).

Tributary 1 has a large catchment area as indicated in Figure 8-14 as Catchment 1, while Tributary 2 (applicable to the Klarinet operations) is smaller and falls within Catchment 4 (Figure 8-14). Catchment area 3 as indicated is applicable to the plant, waste rock and TSF areas directly draining towards the Dwars River, while a small part of Catchment 2 is impacted by the Hoogenoeg opencast area.

Based on current information the Dwars River (which has an Ecological Importance and Ecological Sensitivity of High) deteriorated in condition from a Present Ecological status of Class C (moderately modified) in 1999 to a Class D (seriously modified) in 2011 (Prescali Environmental Consultants, 2020). Based on the monitoring conducted by ECM and during the 2020 surface water assessment, the PES was confirmed as Class D upstream of Tweefontein section, the downstream point had a PES of Class E/F Severely modified in 2018/2019 and could not be assessed during the wet season of 2019 due to lack of interconnectivity between pools. One fish species have been caught namely *Enteromius trimaculatus* (Three Spot Barb).

Riparian vegetation along the unnamed tributary of the Dwars River and the Dwars River itself was found to have a moderate diversity and the condition and groundcover was fair and dense with bare patches along the unnamed tributary (Prescali Environmental Consultants, 2020). Please refer to Section 8.1.6.1 for facultative and obligate wetland species recorded in 2020. Dominant species included trees and shrubs such as *Combretum hereroense* (Mouse-eared bushwillow), *Euclea crispa* (Blue guarri), *Hippobromus pauciflorus* (False-horsewood) and *Ziziphus mucronata* (Buffalo-thorn). Dominant grass species included *Cenchrus ciliaris* (Blue buffalo grass) and *Setaria sphacelata* (Bristle grass). Five exotic species were identified, namely, *Hibiscus cannabinus* (Wild stockrose), *Melia azedarach* (Syringa), *Tagetes minuta* (Tall khaki weed), *Senna occidentalis* (Stinking weed) and *Xanthium strumarium* (Large cocklebur). However, these species did not occur in high densities, but rather as scattered individuals.

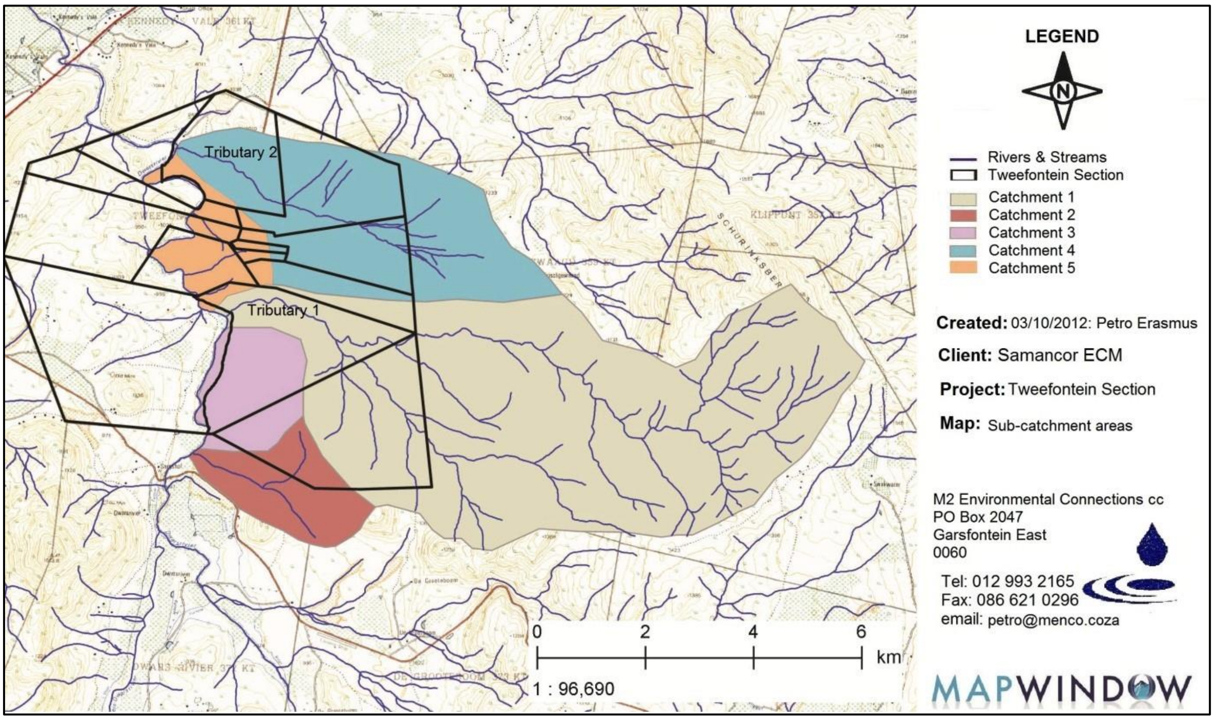


Figure 8-14: Delineation of catchments for streams traversing the project area

From the available monitoring data (2013 – 2019, Table 8-3) it can be seen that the water quality in the Steelpoort River is generally of good quality and with the exception of Magnesium, Nitrates and Turbidity is suitable for domestic use (Prescali Environmental Consultants, 2020). The only parameter that exceeded the TWQR for aquatic use is Ammonia. The water is not recommended for irrigation use due to the impact that it could have on irrigation equipment and crop quality (Chloride, Electrical Conductivity, pH, Suspended Solids, Total Dissolved Solids).

Flow in the Dwars River is measured by the DWS at site B4H009 and data was extracted for the period 01/10/1998 to 30/09/2019. During this time the highest flow was recorded on 26 December 2012 as 19.247 m^3/s (i.e. cumec) (Prescali Environmental Consultants, 2020). The average flow of water in the Dwars River during this time frame ranged from 6.7 cumecs (August) to 50.1 cumecs (January) and is considered to be seasonal and dependant on rainfall conditions. With the exception of the Dwars River, the other streams/ water courses within the study area is ephemeral (with the potential for subsurface flow existing) and does not flow during the dry season. Floodlines as calculated in 2020 for the Dwars River and one of the unnamed tributaries to be impacted by the expansion activities are indicated in Figure 8-15.

Table 8-3: Average Background surface water quality (TDR1 Upstream of Tweefontein in Dwars River, TDR2 Downstream of Tweefontein Dwars River, TDR3 Unnamed tributary of Dwars River)

Parameter		TDR1	TDR2	TDR3	SANS 241-1:2015	Aquatic	Domestic	Agriculture	
								Livestock	Irrigation
Alkalinity	mg $CaCO_3$/l	162.19	183.42	262.38	N/A	N/A	N/A	N/A	N/A
Ammonia	mg NH_3/l	0.24[3]	0.14[3]	0.02	≤1.5 (AS)	< 0.007	≤ 1.0	N/A	N/A
Calcium	mg Ca/l	34.00	36.42	28.03	N/A	N/A	< 32	< 1000	N/A
Chloride	mg/l	8.86	13.45%	10.48	≤300 (AS)	N/A	100	<1500 Monogastrics and poultry; <3000 other livestock	<1
Chromium (VI)	mg/l	<0.01	<0.01	<0.01	N/A	< 0.007	<0.005	< 1	<0.1
Chromium	mg/l	<0.01	<0.01	<0.01	N/A	<0.012 Chromium(III)	N/A	N/A	N/A
Electrical conductivity	mS/m	35.55	46.63%	49.59	≤170 (AS)	15% from normal	< 70	156 (Dairy Pigs and Poultry), 313 Cattle & Horses, 469 (Sheep)	6.25
Magnesium	mg/l	27.97	33.41%	48.29	N/A	N/A	< 30	< 500	N/A
Nitrate	mg/l	6.76	9.76%	4.26	≤11 (AH)	N/A	< 6 NO_3	< 100 NO_3;	N/A
pH	pH units	8.46	8.47	8.52	≤5.0 to ≤9.7 (OP)	5% from normal	6 - 9	N/A	6.5 - 8.4
Potassium	mg/l	1.17	1.22	1.65	N/A	N/A	< 50	N/A	N/A
Sodium	mg/l	9.89	18.33%	21.38	≤200 (AS)	N/A	< 100	< 2000	< 70
Sulphate	mg/l	20.44	28.77%	22.57	≤500 (AH); ≤250 (AS)	N/A	< 200	< 1000	N/A
Suspended Solids	mg/l	39.45	32.32	<3.27		N/A	N/A	N/A	< 50*
Total Dissolved Solids	mg/l	251.48	309.45%	324		Guideline	< 450	< 1000 Dairy, pigs and Poultry; < 2000 Cattle and horses; < 3000 Sheep	<40
Turbidity	NTU	17.72	12.53	7.22	≤1 (OP); ≤5 (AS)	N/A	< 1	N/A	N/A
*Clogging of drip irrigation systems CH: Chronic Health					AS: Aesthetics % More than 15% increase from upstream concentration				

[3] N_Ammonium

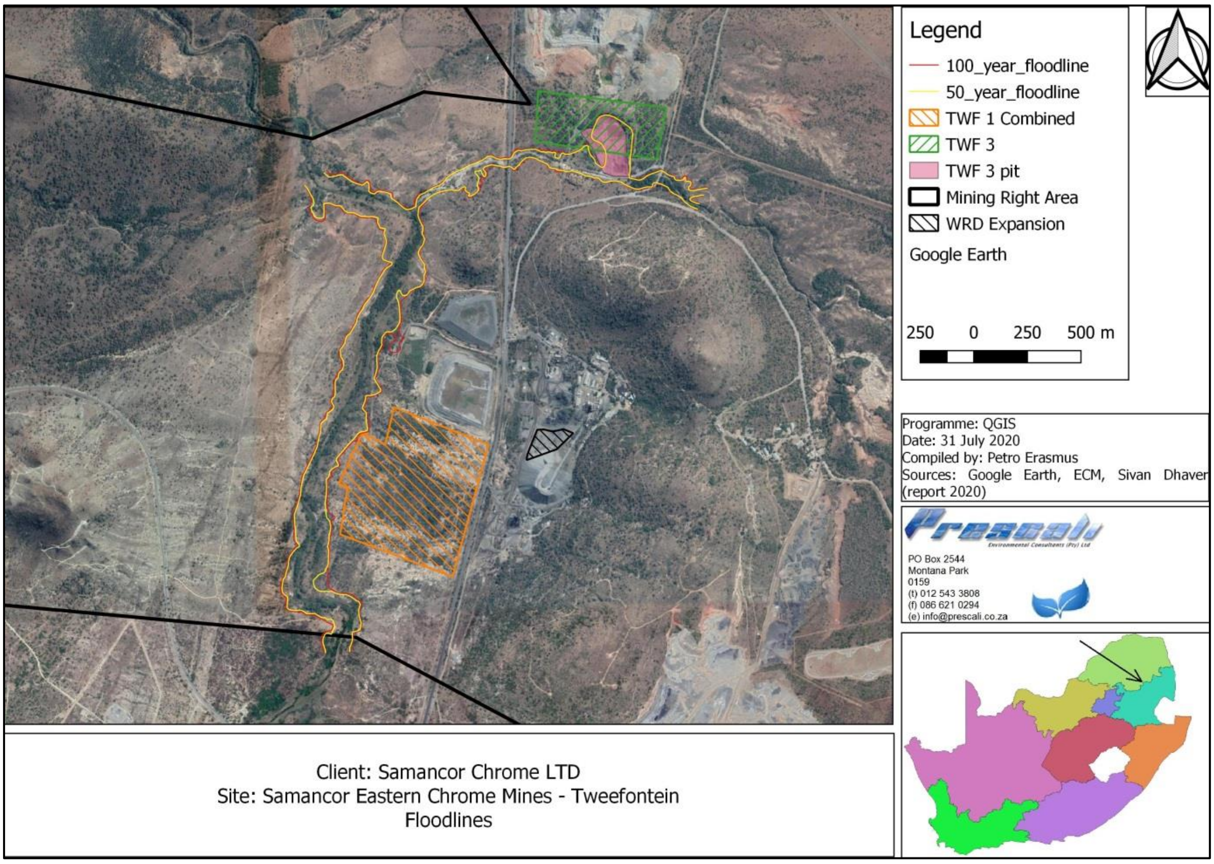


Figure 8-15: Floodlines for the Dwars River and unnamed tributary

8.1.8. Wetlands

As defined by the National Water Act, 1998 (Act No. 36 of 1998) a wetland is "*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.*" In order to be classified as a wetland the following attributes have to be present (DWAF, 2005):

- Hydromorphic soils that exhibit features characteristic of prolonged saturation;
- The presence of hydrophytes (even if only infrequently); and
- A shallow water table that results in saturation at or near the surface, leading to the development of anaerobic conditions in the top 50 cm of the soil.

From the NFEPA database for wetlands no wetlands were identified within the mining right area and this was confirmed in 2020 (Prescali Environmental Consultants, 2020). However, from a study conducted by Aquifex Biological Services in 2012 (as per the approved 2013 EMPr) there are areas of the Dwars River that are considered to be channelled wetlands.

8.1.9. Hydrogeology and aquifers

GPT conducted a geohydrological assessment in 2020 and the information in this section was sourced from their report (Appendix 7) (GPT, 2020)

The aquifer at Tweefontein Section can be classified as a "Minor Aquifer System" and it has a vulnerability can be regarded as "medium" based on the Groundwater Decision Tool (GDT) of 49%. The aquifer has a protection status of "Medium."

Minor Aquifer Systems are aquifers that can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers.

The groundwater potential is generally good with 42% of the successful boreholes yielding >2 ℓ/s. and available borehole yield analysis indicated that approximately 27% of 119 boreholes documented yield between 2 – 5 ℓ/s, 26% yield between 0.5 – 2 ℓ/s, 23% between 0.1 – 0.5 ℓ/s, and 15% are stronger than 5 ℓ/s. The median borehole yield is 1.0 ℓ/s and the maximum encountered was 25 ℓ/s.

Generally the Rustenburg Layered suite fractures aquifers have a porosity of 0.05 and a hydraulic conductivity of 10^{-5} $m.d^{-1}$ and movement will be preferentially in secondary structures such as joints, faults and fractures.

A hydrocensus was conducted and five boreholes were inspected, none of the boreholes were available for groundwater level monitoring. Groundwater level data was provided by the client for the entire monitoring period from October 2012 till March 2019. A total of 20 groundwater level were measured in March 2019. The groundwater levels varied between a minimum of 5.05 m and a maximum of 60.28 m below ground level. The information is visually represented in Figure 8-16.

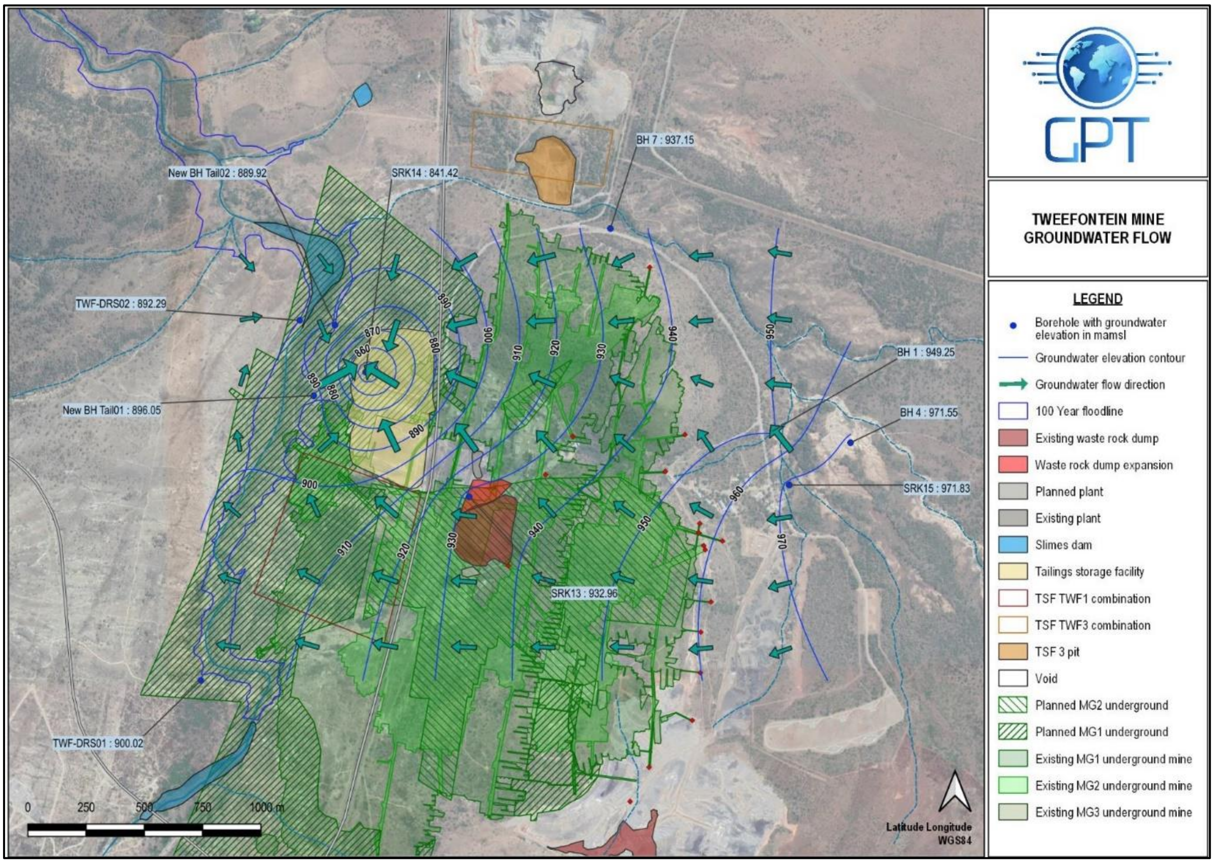


Figure 8-16: Contoured water levels

The water at Tweefontein Section is not suitable for domestic use due to the average nitrate level being above the maximum allowable limit for potable water (Table 8-4). One EC measurement was also above the maximum allowable limit with corresponding high chloride and magnesium values. This point is, however, an anomaly and may be due to local contamination. A total of 105 chemical analyses were available for interpretation from the client (Table 8-5) and four boreholes were sampled during the hydrocensus. The majority of boreholes in and around the active mining area have a HCO_3^- signature, typical of unpolluted shallow groundwater (Figure 8-17, Figure 8-18).

Table 8-4: Hydrocensus boreholes water quality (2020)

Parameter		Unit	SANS 241: 215 Recommended Limits	Risk	Results			
					BH1	BH2	BH3	BH4
Physical & Aesthetic Determinants								
Electrical conductivity at 25C	EC	mS/m	≤ 170	Aesthetic	112	93.3	151	78.2
Total Dissolved Solids	TDS	mg/liter	≤ 1200	Aesthetic	782	653	1050	547
pH at 25C		pH units	≥ 5 to ≤9.7	Aesthetic	7.83	8.21	7.63	7.64
Chemical Determinants - Macro Determinants								
Nitrate as N	NO_3	mg/liter	≤ 11	Acute Health	30.1	17.2	6.6	5.66
Sulphate	SO_4	mg/liter	Acute Health ≤500; Aesthetic ≤250	Acute Health/Aesthetic	42.9	47.5	107	56.4
Fluoride	F	µg/liter	≤1500	Chronic Health	159	84	79	75
Ammonia as N	NH_3	mg/liter	≤ 1.5	Aesthetic	0	0	0	0
Chloride	Cl	mg/liter	≤ 300	Aesthetic	46	51.7	191	23
Sodium	Na	mg/liter	≤ 200	Aesthetic	75.5	35.1	44.2	23.6
Zinc	Zn	µg/liter	≤5	Aesthetic	0	0	70	60
Total Chromium	Cr	µg/liter	≤ 50	Chronic Health	0.06	0	0	0
Copper	Cu	µg/liter	≤ 2000	Chronic Health	0	0	0	0
Total Iron	Fe	mg/liter	Acute Health ≤ 2; Aesthetic ≤0.3	Acute/Aesthetic	0	0	0	0
Total manganese	Mn	mg/liter	Acute Health ≤0.4; Aesthetic ≤0.1	Acute/Aesthetic	0	0	0	0
Aluminium	Al	µg/liter	≤ 300	Operational	0	0	0	0
Concentration deemed to present an unacceptable health risk for lifetime consumption.								

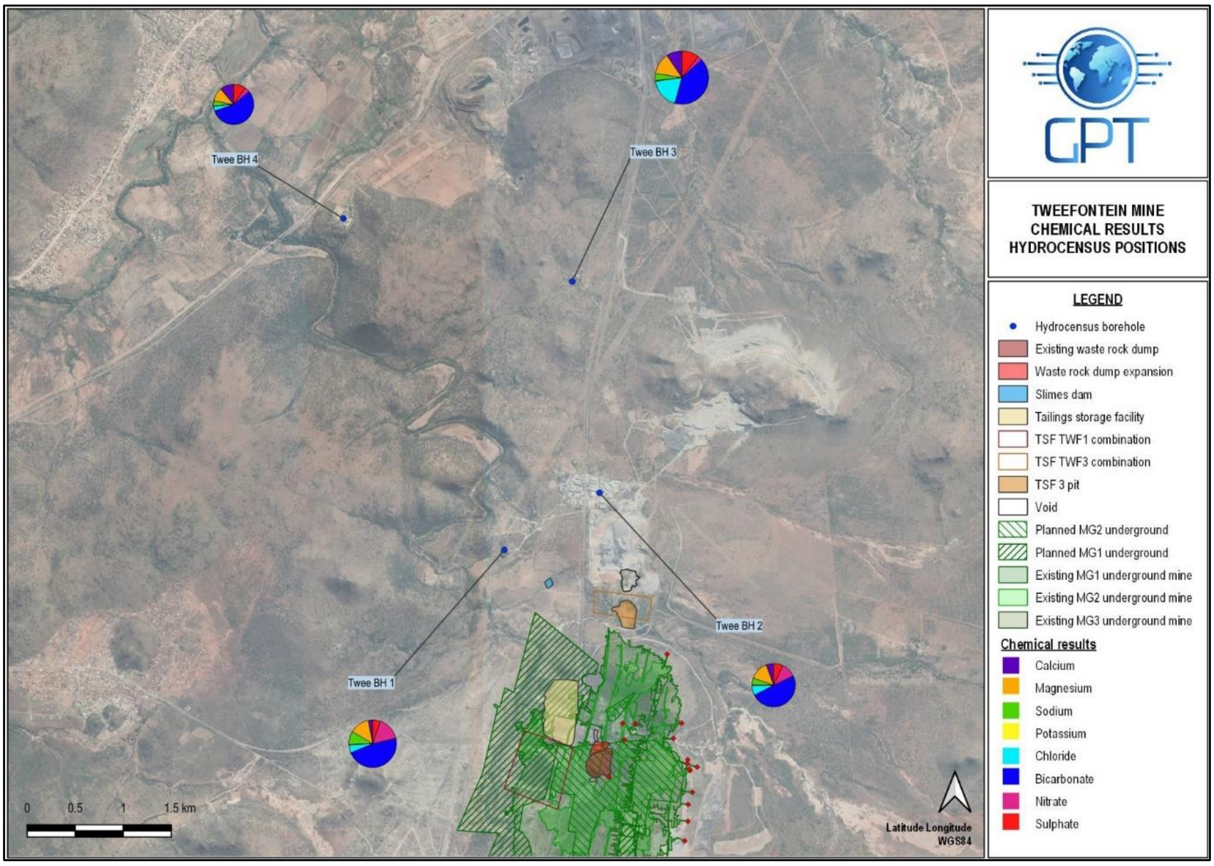


Figure 8-17: Pie diagrams for 2020 hydrocensus water samples

Table 8-5: Historical groundwater monitoring

Parameter		Unit	SANS 241: 2015 Recommended Limits	Risk	Results								
					SRK13	TWF DS	BH 7	TUG	BH 1	BH 3	SRK15	SRK12	SRK14
Physical & Aesthetic determinants													
Electrical conductivity at 25ºC	EC	mS/m	≤ 170	Aesthetic	157	170	86.3	122	91.4	74.7	67.7	180	163
Total Dissolved Solids	TDS	mg/liter	≤ 1200	Aesthetic	992	1090	624	672	612	418	362	1056	1032
pH at 25ºC		pH units	≥ 5 to ≤9.7	Aesthetic	7.9	8.03	7.87	8.49	7.43	7.98	7.21	7.63	7.53
Chemical Determinants - Macro determinants													
Nitrate as N	NO_3	mg/liter	≤ 11	Acute Health	73.6	107	3.25	54.2	7.46	0.79	-0.459	57.9	-0.459
Sulphate	SO_4	mg/liter	Acute Health ≤500; Aesthetic ≤250	Acute Health/Aesthetic	142	162	40.3	69.9	41	31	2.58	244	4.71
Fluoride	F	µg/liter	≤1500	Chronic Health	0	0	0	0	0	0	0	0	0
Chloride	Cl	mg/liter	≤ 300	Aesthetic	66.8	69	29.5	44.5	22.1	10.7	25.9	87.2	87
Sodium	Na	mg/liter	≤ 200	Aesthetic	55.1	87.5	20.1	53.6	17.6	17	26.4	102	98.1
Zinc	Zn	µg/liter	≤5000	Aesthetic	0	0	0	0	0.02	0	0	0	0
Chemical Determinants - Micro determinants													
Antimony	Sb	µg/liter	≤ 20	Chronic Health	0	0	0	0	0	0	0	0	0
Barium	Ba	µg/liter	≤ 700	Chronic Health	0.028	0.082	0.02	0.08	0.07	0.02	0.023	0.047	0.022
Boron	B	µg/liter	≤ 2400	Chronic Health	0	0	0	0	0	0	0	0	0.071
Cadmium	Cd	µg/liter	≤ 3	Chronic Health	0	0	0	0	0	0	0	0	0
Total Chromium	Cr	µg/liter	≤ 50	Chronic Health	0	0	0	0	0	0	0	0	0
Copper	Cu	µg/liter	≤ 2000	Chronic Health	0.016	0.017	0.02	0.02	0.02	0.02	0.013	0.021	0.015
Total Iron	Fe	mg/liter	Acute Health ≤ 2.0; Aesthetic ≤0.3	Acute/Aesthetic	0	0	0	0	0	0	0.303	0	0
Lead	Pb	µg/liter	≤ 10	Chronic Health	0	0	0	0	0	0	0	0	0
Total manganese	Mn	mg/liter	Acute Health ≤0.4; Aesthetic ≤0.1	Acute/Aesthetic	0.045	0.09	0	0	0.01	0	1	0.006	0.086
Nickel	Ni	µg/liter	≤ 70	Chronic Health	0	0.007	0	0	0	0	0	0	0
Aluminium	Al	µg/liter	≤ 300	Operational	0	0	0	0	0	0	0	0	0
Concentration deemed to present an unacceptable health risk for lifetime consumption.													

Parameter		Unit	SANS 241: 2015 Recommended Limits	Risk	Results								
					RWD-TFN	New BH Tail01	TWF Tailings Dam	New BH Tail02	TDR01	TWF-DRS01	TDR02	TWF-DRS02	TDR03
Physical & Aesthetic determinants													
Electrical conductivity at 25ºC	EC	mS/m	≤ 170	Aesthetic	173	133	148	131	41.9	45.2	48.1	81.1	48
Total Dissolved Solids	TDS	mg/liter	≤ 1200	Aesthetic	1210	732	790	820	290	236	254	600	296
pH at 25ºC		pH units	≥ 5 to ≤9.7	Aesthetic	8.07	8.13	8.36	7.87	8.33	7.82	8.34	7.54	8.35
Chemical Determinants - Macro determinants													
Nitrate as N	NO_3	mg/liter	≤ 11	Acute Health	105	30.7	36.6	6.3	7	0	9.19	0.948	9.03
Sulphate	SO_4	mg/liter	Acute Health ≤500; Aesthetic ≤250	Acute Health/Aesthetic	212	118	257	81.3	18.4	2.91	24.7	26.3	25.7
Fluoride	F	µg/liter	≤1500	Chronic Health	0	0	0	0	0	0	0	0	0
Chloride	Cl	mg/liter	≤ 300	Aesthetic	72.3	64.2	69.2	54.6	8.42	0	12	0	11.5
Sodium	Na	mg/liter	≤ 200	Aesthetic	94.8	134	92.3	142	9.18	22.2	15.3	43.9	14.8
Zinc	Zn	µg/liter	≤5000	Aesthetic	0	0	0	0	0	0	0	0.009	0
Chemical Determinants - Micro determinants													
Antimony	Sb	µg/liter	≤ 20	Chronic Health	0	0	0	0	0	0	0	0	0
Barium	Ba	µg/liter	≤ 700	Chronic Health	0.088	0	0.148	0.016	0.017	0	0.016	0	0.02
Boron	B	µg/liter	≤ 2400	Chronic Health	0.042	0.048	0.072	0.053	0	0	0	0	0
Cadmium	Cd	µg/liter	≤ 3	Chronic Health	0	0	0	0	0	0	0	0	0
Total Chromium	Cr	µg/liter	≤ 50	Chronic Health	0	0	0	0	0	0	0	0	0
Copper	Cu	µg/liter	≤ 2000	Chronic Health	0.018	0.017	0.018	0.015	0.009	0	0.01	0	0.011
Total Iron	Fe	mg/liter	Acute Health ≤ 2.0; Aesthetic ≤0.3	Acute/Aesthetic	0	0	0	0	0	0	0	0	0
Lead	Pb	µg/liter	≤ 10	Chronic Health	0	0	0	0	0	0	0	0	0
Total manganese	Mn	mg/liter	Acute Health ≤0.4; Aesthetic ≤0.1	Acute/Aesthetic	0.082	0.019	0.005	0.085	0	0.081	0	0.094	0
Nickel	Ni	µg/liter	≤ 70	Chronic Health	0	0	0	0	0	0	0	0	0
Aluminium	Al	µg/liter	≤ 300	Operational	0	0	0	0	0	0	0	0.021	0.007
Concentration deemed to present an unacceptable health risk for lifetime consumption.													

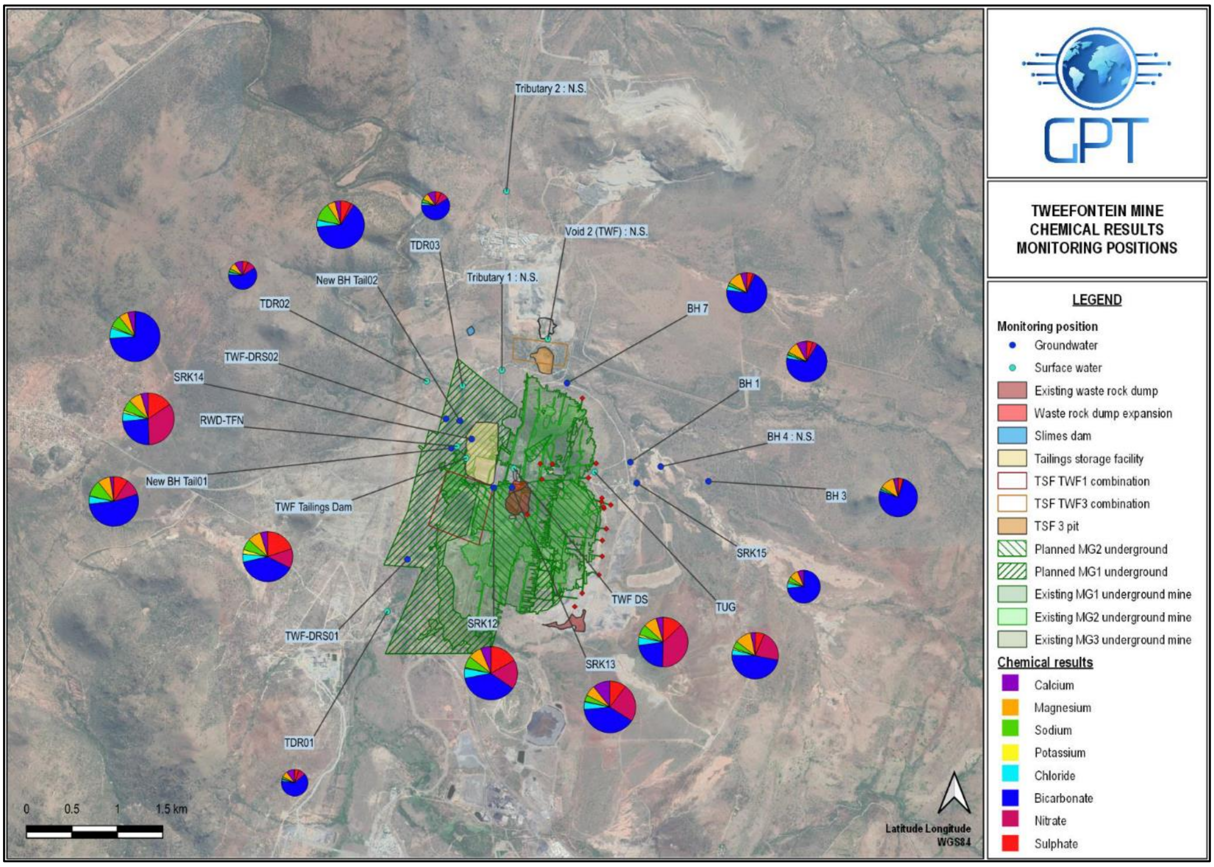


Figure 8-18: Historical monitoring Pie diagrams

8.1.10. Heritage Resources

With the exception of the sites outlined below, no heritage sites were identified at Tweefontein Section. The following should however be noted:

- Some Stone Age sites and artefacts are known to exist in the larger geographical area, and were identified and studied by the author during previous assessments and archaeological mitigation at the Tailings Retreatment Lannex section (Pelser et.al 2010 as cited by (Pelser, A., 2020)). These sites are open-air surface sites located in and around erosion dongas and located some distance from the Tweefontein Section.
- Early Iron Age sites are known to exist in the larger Steelpoort Valley area (Pistorius 2006 as cited by (Pelser, A., 2020)), while Later Iron Age stone-walled sites are also known and have been archaeologically studied in the larger geographical area in the past (Van Schalkwyk 2013; Pelser 2013 as cited by (Pelser, A., 2020)).
- A full description of the heritage of the area is provided in Section 6 of the 2020 assessment (Pelser, A., 2020).

Specific note should be taken of the heritage sites identified during site specific assessments undertaken as part of the phased approach of the mining activities as outlined below (Figure 8-26).

The following heritage resources were identified at Klarinet opencast area (Pistorius, 2006):

- RP01: The remains of a village dating from the recent past (S24º 51.706' E30º 07.730') with a low level of significance.
- GY01: An informal graveyard which can possibly be associated with the village dating from the recent past S24º 51.706' E30º 07.730') with a high level of significance.
- CM01: Mining heritage remains relating to earlier chrome mine activities S24º 51.686' E30º 07.824' to S24º 51.755' E30º 07.759') with a high level of significance.

During the 2020 assessment three (3) archaeological sites were identified in the TWF1 (Pelser, A., 2020) area dating to the Stone- and Iron Age periods, but there is a high likelihood that more are located in the TWF1 area and in the erosion donga that is partially situated within the area and bordering the area. All three the sites have a cultural rating of Medium – High with a heritage significance of Grade III (Other heritage resources of local importance and therefore worthy of conservation). The Field Rating is General protection A (IV A) and the site should be mitigated before destruction.

- Site 1 (S24º 53' 52.00" E30º 06' 55.00") is located close to and on a rocky ridge and granite boulders, and consists of a number of grinding hollows on the granite, while an upper grinding stone was also found close-by. No pottery was found.
- Site 2 (S24º 53' 48.30" E30º 06' 53.20") contains scatters of MSA/LSA stone tools and flakes, while Iron Age pottery was also found in close proximity.
- Site 3 (S24º 53' 48.20" E30º 06' 53.90") is the clay remains of a possible Iron Age metal smelting furnace OR Grainbin, eroding out from the calcretes in the erosion donga.

8.1.11. Socio-Economic Environment

A Socio-Economic Assessment was conducted in 2020-2021 by Gudani Consulting (Gudani Consulting, 2021) taking into consideration that Tweefontein Section is located within the Fetakgomo-Greater Tubatse Local Municipality (FGTLM) area which forms part of the Sekhukhune District Municipality.

8.1.11.1. Population and Demography

The Fetakgomo-Greater Tubatse Local Municipality is part of Sekhukhune District and the largest municipality in the district. Its population is approximately 429 471 (Census 2011 as cited by Gudani Consulting (2021)) with 106 050 households; these making the Fetakgomo-Greater Tubatse Local Municipality the municipality with highest population in the Sekhukhune district (Draft IDP 2018/2019 as cited by Gudani Consulting (2021)). Due to the high mountain ranges, the population is sparsely distributed with many settlements located in valleys. In certain areas the topography is very steep making it impossible for inhabitation.

The Municipality features approximately 342 sparsely populated and dispersed rural settlements, with Burgersfort, Ohrigstad, and Steelpoort constituting the main/first order urban centres. The urban centre closest to the Tweefontein project site is Steelpoort, which is approximately 9 km north-east of the site. The spatial location of these first order centres generally coincide with the municipality's dominant economic activities. Despite having been influenced by the spatial demarcation of the former homeland areas, the spatial occurrence of settlements has also been influenced by:

- The spatial location of major agricultural and mining activity areas;
- The spatial location of major rivers traversing the municipality; and
- The spatial location of major roads such as R37, R36 and R555.

It is estimated that a total of 1 507 people reside in the nearby affected village of Mahlagari. The village comprise of approximately 433 households with an average of 4 persons per household. In terms of the demography of the population 49% are female and 51% are male. There are a high (17%) number of children between 0- 4 years, youth between 20-24 years (8%) and 25- 29 years (10%) which indicates a potential for marked rise in local population in the next decade as pre-adolescent reach child bearing age. This group can be viewed as being high vulnerable to HIV/Aids and other sexually transmitted diseases in the absence of health education. Their vulnerability is also increased due to the fact that employment opportunities are low in the area, with the exception of mining which is predominantly taken by men.

A higher number of households (29%) have at least one person. Only 12% are two people living on the same stand and in one household, which may be interpreted as couples. 17% are 3 person households, 12% are four person households, 11% amounted to five person households, 6% to six person households and 12% to seven or more persons in each household. It is not uncommon however, to have two or more households living in one stand. While some households may have immediate and extended families on the same stand, the head families may use the extra room to rent out to workers and other relocating families as temporary residencies in the form of shacks and backroom until a permanent solution is reached. It is therefore quite common to have more than one households living in one stand in rural areas.

It may be interpreted that of the two and more household sizes, some may be single parents and some may have live-in partners and children. The average size of a family in a rural area is likely to be more than that in an urban area. In rural areas the culture of extended family relations is still highly practiced as opposed to urban areas whereby families are more independent of their immediate relatives.

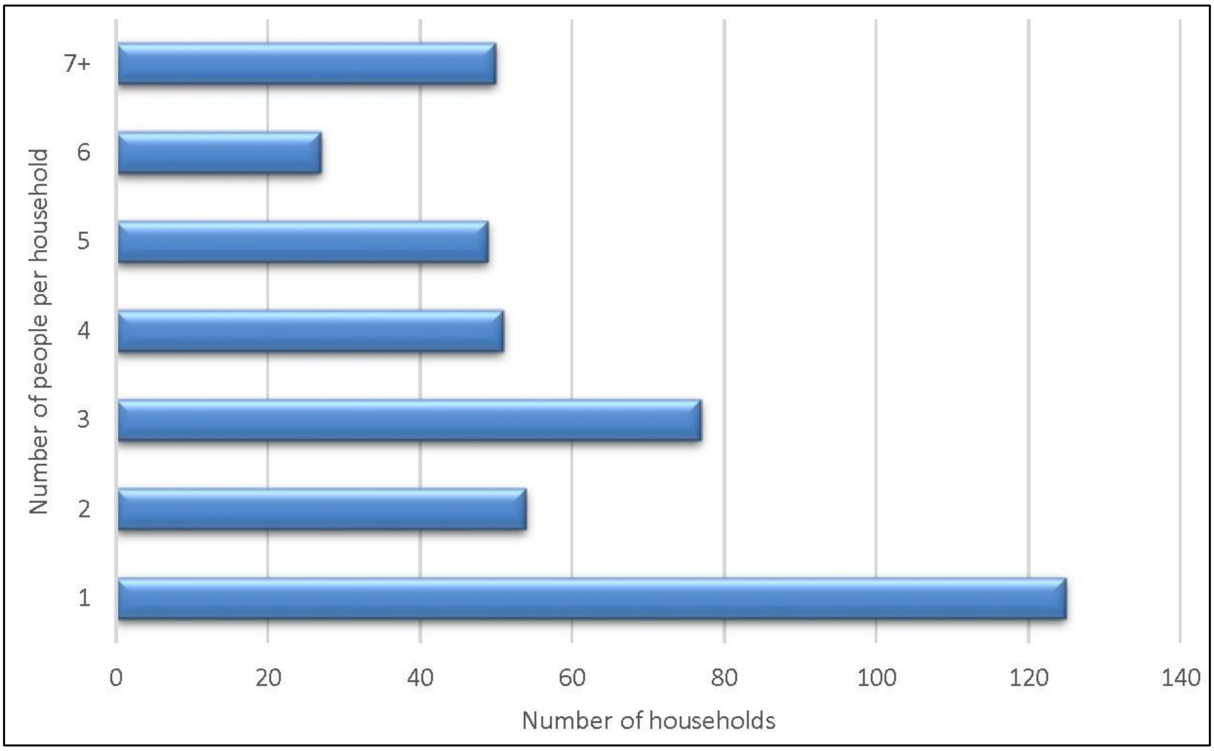


Figure 8-19: Number of people per household

8.1.11.2. Institutional Arrangements and Community Structures

Mahlagari village is located in the middleveld in Sekhukhune District Municipality of the Limpopo Province. It is under tribal jurisdiction and has ward councillors who work with the respective Tribal Authority to promote local economic development. The village thus falls under the responsibility of the chief (Kgoshi) and Tribal Council. The said tribal council consists of the chief, advisers and headmen. Traditional authorities play a significant role in local governance in the context of community leadership structures and land related issues.

Internally the village has a number of prominent institutions that allow for more efficient allocation and use of scarce resources for the greater benefit, given the low incomes generated by many. These institutions include burial societies; churches/religious groups, savings groups and production groups.

8.1.11.3. Economic Activities, Employment and Income

The Fetakgomo Tubatse Local Municipality economy is a strange mixture of overwhelmingly negative features. It has the highest unemployment and poverty rates in the Limpopo Province and extensive positive opportunities – including abundance of mining potential within the area. The major economic drivers in the local municipality are mining, agriculture and tourism, with mining as the mainstay of the local economy. It would therefore suffice to say that mining (both large and small scale) has a huge potential for the immediate future.

The following economic activities were identified:

- ***Agricultural Sector***: The significance of agriculture in Fetakgomo-Greater Tubatse Local Municipality cannot be over-emphasized. Agriculture in the area is a mixture of both commercial and subsistence farming. Agricultural activities occur closer to water sources, namely the Spekboom River, Steelpoort River the Olifants River, where the flood plains have fertile soils and the irrigation opportunities are in abundance. Despite agriculture being an important contributor to employment within the local municipality, low capacity utilization (due to poor investment in mechanization schemes) and the uncertainty created by land claims is discouraging the expansion of commercial agricultural activities within the municipality.
- ***Tourism Sector***: The tourism sector in the Fetakgomo-Greater Tubatse Local Municipality is connected to the local economic activities, mainly mining, which has overshadowed the areas potential to attract tourism activities. The municipality hosts heritage sites and tourism assets that can reinforce future growth potential for the sector. However, there exist tourist attractions such as the scenic De Hoop Dam, the Potlake Game Reserve, Sehlakwe Waterfalls, Phahlamanoge Wind Stones, Tjate Heritage Site, Lenao-La-Modimo, Platinum Belt and the Strydom Tunnels. Although tourism has been viewed as one of the emerging growth sectors in the municipality, the municipality lacks major product to draw a sizable portion of holiday tourists to the area. A major draw card could however firmly place the municipality on established tourist routes to the Blyde River Canyon and Kruger National Park. Fetakgomo-Greater Tubatse Local Municipality has multiple (15) nature reserves which form part of its protected areas as the municipality deems it important to preserve its natural environment. A large portion (80%) of land, in Fetakgomo-Greater Tubatse Local Municipality is natural environment, which comprises of bushveld and areas of thinly dispersed and scattered grassland. The Kruger to Canyon biosphere, stretches onto the municipality's northern borders, this presents benefits for the municipality.
- ***Mining Sector***: Modern mining has been carried out in the larger area (Sekhukhune district) for well over a century, and it generally involved the exploitation of andalusite, asbestos, chromite and platinum deposits from the Merensky Reef, which forms part of the mineral rich Bushveld Complex. The District features the world's largest deposit of the platinum group metals (PGMs) and 70% of the world chrome deposit. Previous bouts of mining activity in the area let to the opening and closing, and occasionally re-opening of mines due to the fluctuating commodity prices. When prices rose, new exploration and development took place in the Sekhukhune mining sector. On the other hand, when prices fell, mines in the area closed. This is an important characteristic to observe when planning and expanding mining operations in the District. At present, operational mines found within the Fetakgomo Tubatse Local Municipality are mainly situated along the Dilokong Corridor (R37 and R555). The Dilokong corridor stretches across the Fetakgomo and Greater Tubatse Local Municipalities. Major mining companies operating in the municipality include Anglo Platinum, Xstrata, Samancor Chrome Limited, BHP Billiton, Implats, ASA Metals, Corridor Mining Resources and Marula Platinum. In spite of the involvement of major mining companies, mining in the municipality has not yet reached maximum production limits.

In the Mahlagari village employed persons add up to 48%, 47% is unemployed persons, 5% is discouraged work seekers. Only 16% has no means of income but the majority (84%) do earn an income. The annual household percent income distribution in Mahlagari village is as follows: 5% of the households fall within the income bracket R 1 – R 4 800. This income bracket is constituted predominantly by those households earning a living solely from government grant, pension or labour. Those earning between R 4 801 – R 9 600 constitute 11% and are most likely earning a salary. 15% earn between R 9 601 – R 19 600, 16% earn between R 19 601 – R 38 200, 25% earn between R 38 201 – R 76 400, 17% earn R 7 6401 – R 153 800 and 7% earn R 153 801 or more. These are most likely to be skilled workers.

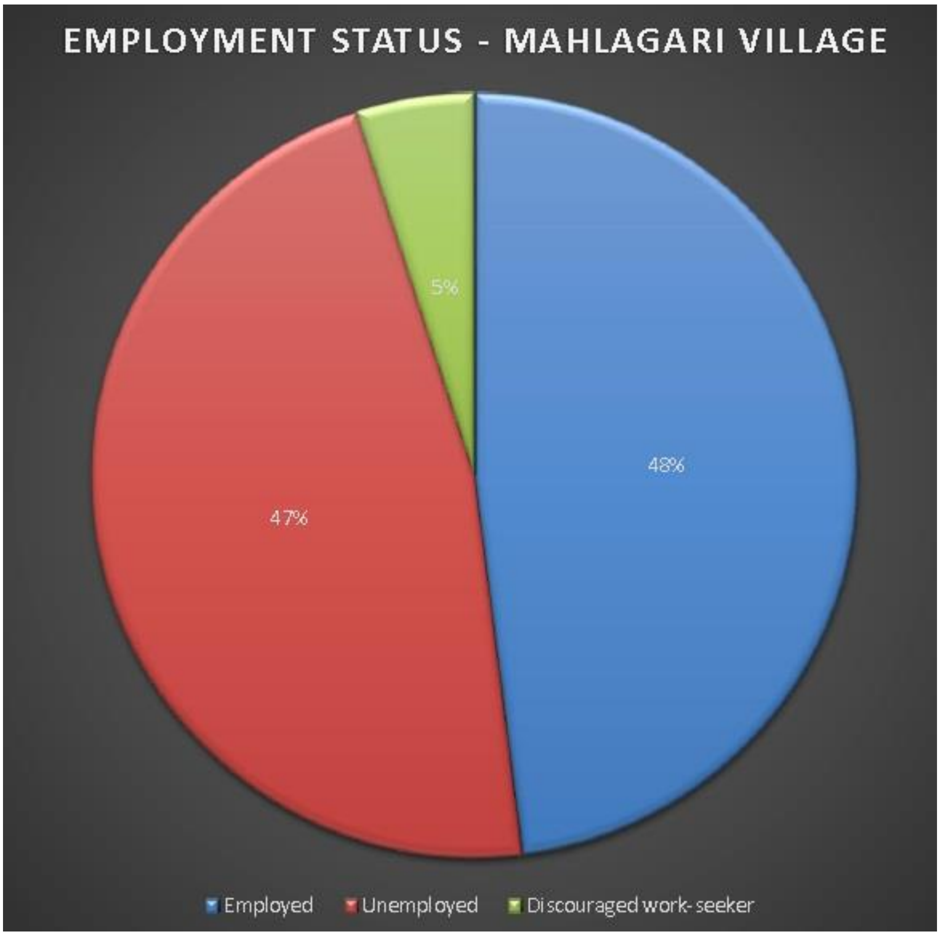


Figure 8-20: Employment status at Mahlagari village

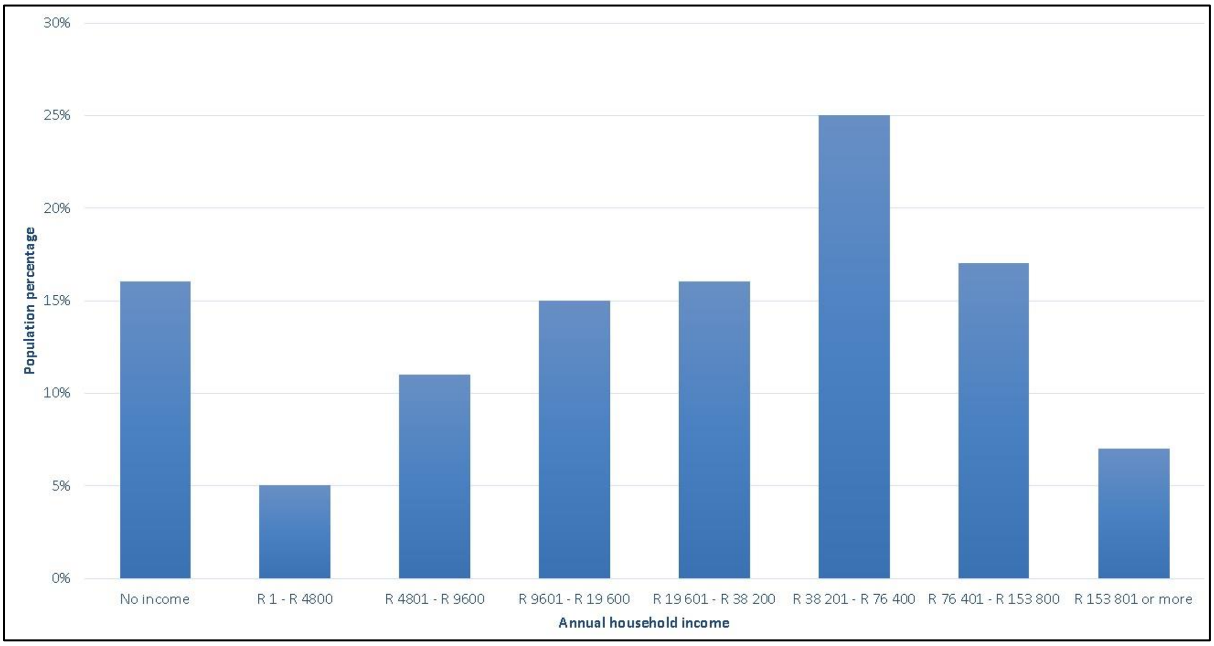


Figure 8-21: Annual household income at Mahlagari village

8.1.11.4. Health and Medical Facilities

The medical facilities are very limited in the area. There is no clinic to provide health care services in the Mahlagari village. It is evident that the existing health care facilities are limited to meet all the health requirements and needs of the community. Pregnant women and the old age are amongst the most vulnerable.

8.1.11.5. Housing

In terms of the Tribal Authority system, permission to occupy land for housing and agriculture is granted by the respective local chief (Kgoshi). Most households or homesteads comprise of a dwelling, a small patch of cultivated ground, often with a kraal for livestock. Houses are typical brick and concrete with corrugated iron or tile roof, and few houses are made of stone/rock. Some dwelling also have corrugated iron shack in the backyards.

8.1.11.6. Education Levels and Training

There is one school in the Mahlagari village the Mmahlagare Combined School. These learning facilities do not offer vocational/technical/business training to locals

According to the 2011 data from Stats SA, 18% of the population in Mahlagari village have no schooling, 7% have some primary schooling, 5% have complete primary schooling, 84% have secondary schooling, 20% have standard 10/ grade 12 (matric) and 4% have higher education level. The poor level of education has serious implications for the potential of local people to gain employment. This is worsened by the general shortage of skills in the local community, compounded by the lack of training opportunities in areas of science, computer literacy, technical and technological expertise. With the potential employment opportunities from the Tweefontein Project, there will be few qualified persons available to fulfil the job specifications. There are a number of people with teaching diplomas, and a few drivers, motor mechanics and builders – however the overall empowerment in the livelihoods the affected four communities would largely depend on capacity building and technical skills training from Tweefontein Project.

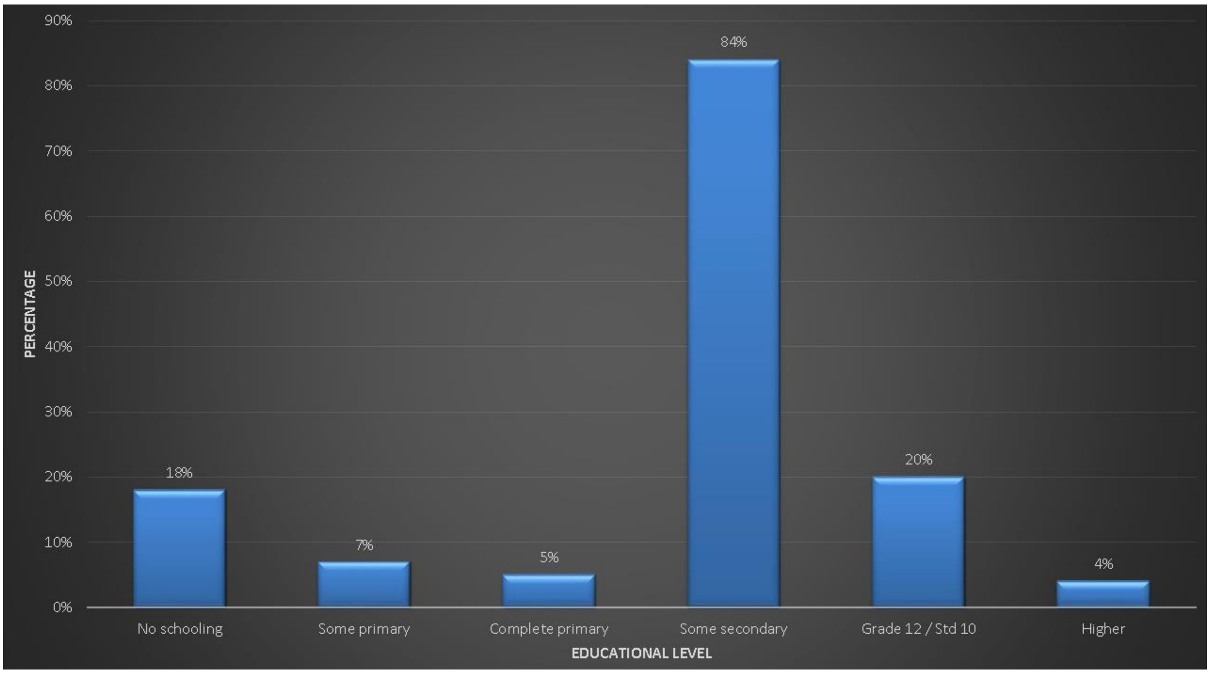


Figure 8-22: Education levels in Mahlagari village

8.1.11.7. Land Holding and Tenure

Land in rural villages is entrusted to traditional authorities by the state and respective municipality as "Tribal Land". All matters related to the land holdings are controlled by traditional authorities at community level.

In Mahlagari village plots are owned individually by households. Plots are demarcated by distinct fences or natural markers such as trees and rocks and range from 0.2 - 4 hectares in extent.

Big businesses are absent from the Mahlagari village. The smaller businesses are normally found scattered through the residential village area and are informal in character. Lack of business and employment has caused people to migrate to the bigger towns especially Burgersfort, Polokwane and Lebowa-Kgomo in search job opportunities.

8.1.11.8. Water Supply and Sanitation

Water supply in the affected villages is mainly from groundwater. Water is pumped from underground into a reservoir/elevated tank on the surface, from where is directed to various communal/public stand pipes/taps. 23% of the households depend on the communal taps for access to drinking water. Few dwellings (5%) have piped connections and running water in their individual households, a further 67% of the households have boreholes in their respective yards and 4% depend on rain water harvested from the roof tops, springs or dams.

Water availability is extremely scarce in the area and the community experience frequent water shortages – especially during the dry winter months. Use of natural, untreated water sources increases the risk of waterborne diseases.

1% of the households have flush or septic tank toilets in the affected community. Majority of the households (75%) have pit toilets with no ventilation systems and a further 1% have the same pit with ventilation. 0.5% of the households have no latrine facilities or are using the bucket system, resulting in proper ablution being compromised.

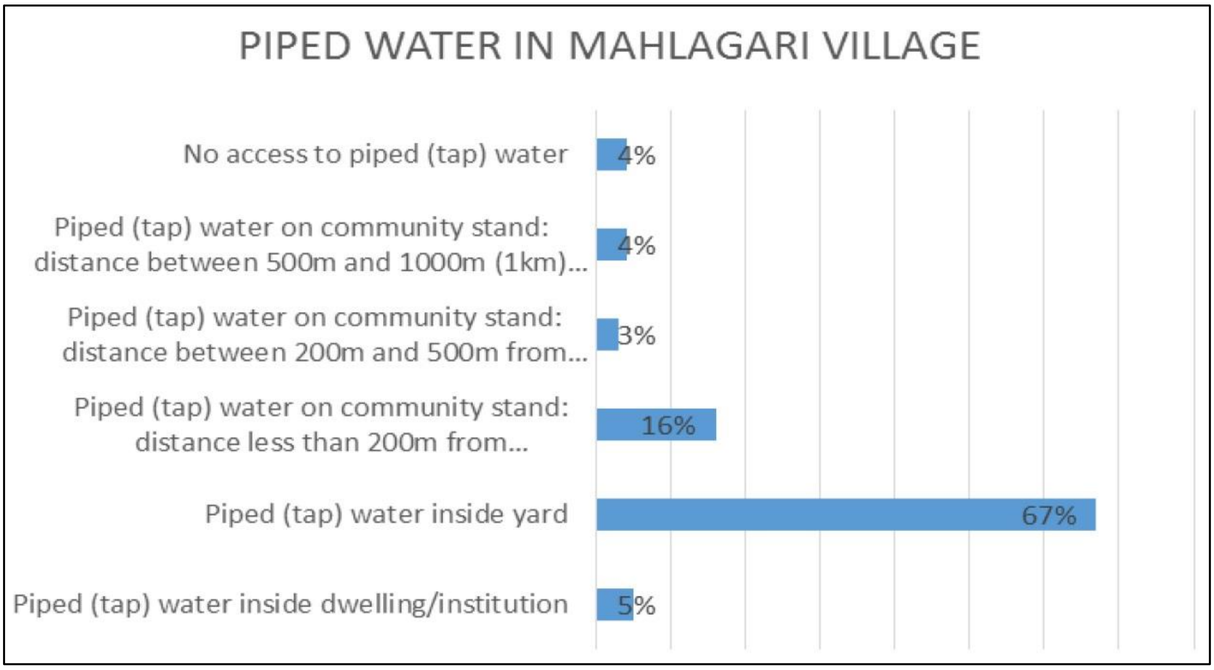


Figure 8-23: Piped water in Mahlagari village

8.1.11.9. Infrastructure, Electricity and Communication

The level of infrastructure in the affected community – Mahlagari is very low with poor means of transport. There is no commercial infrastructure in the village and 16% of the people have no means of income. The lack of income exacerbated by poor transport links imply that many residents may not be able to afford visit to town frequently and may hence go without supplies. Of the entire Mahlagari population, only 5% has piped (tap) water inside their dwellings and 67% has piped (tap) water inside the yard. 4% has no access to piped (tap) water which implies that they rely on rain water or have to walk long distances to fetch water.

There is no police station in the village. Access to local policing services can be sought at Burgersfort. There is no formal waste disposal site and collection method within the village. The predominant disposal methods are burning or burying.

The electricity provider in Mahlagari village is ESKOM. The said electricity power is mainly used for lighting in households due to financial constraints for other uses such as heating and cooking. It is important to note that most households in the village are not electrified as such, electricity backlogs need to be addressed to ensure electrification in all households. The lack of access to electricity poses a problem to the village and municipality as it impacts negatively on local economic development and community projects.

The use of animal gas and paraffin and wood as an energy source is common in the village and it is ascertained that almost all households without electricity depend on either wood or animal gas as an energy source for cooking or heating. Some households use a combination of wood and paraffin for their energy needs. Wood is a natural source that is generally used in most rural areas. Even in a case where electricity is available, it is typical to find rural households using firewood to heat water and for cooking.

Communication within the Mahlagari village is by mobile public phones and individual cell phones. Other forms of communication include radio and satellite television.

8.1.11.10. Access Roads

The affected village of Mahlagari is situated alongside the R577 (Sekhukhune/ Lydenburg) national road. A survey conducted over a period of five days shows that this road current carries an average of 9200 during the morning hours (06h00-09h00), approximately 8290 vehicle during vehicles daytime (12h00-14h00) and 9100 vehicles in the evening (16h00-18h00).

Access through the affected village is by both tar and gravel or small dirt roads. Transport is mainly by mini-bus taxis and buses

8.1.11.11. Language, Religion, Cultural History and Traditional Practices

The village of Mahlagari is pedi speaking community. The predominant language in the community is sePedi.

The Bapedi originated from the Bakgatla and moved to the Eastern-Central Transvaal. This is where they built a powerful empire in Bopedi, by a skilful combination of diplomacy and military conquest. Their motto, "Fetakgomo o sware Motho, Mofetakgomo ke moriri oa hloga", was used to build a strong and revered Pedi nation. They implemented it practically in building a nation by bringing in small tribes, not slaughtering the weak and defeated people, by using cattle to marry as many women as possible from neighbouring tribes, by admitting outsiders and refugees into the fold of the tribe and by conquering recalcitrant tribes. The empire grew over time to a stage where at the zenith of its success it covered the area between the Lekwe (Vaal) and the Lebepe (Limpopo) rivers, in the south and north, and the Komati river and the Kgalagadi, in the East and in the West respectively (Magubane, 1998:p127). They regarded the entire vast land as their own and Pedi soldiers were sent to check the boundaries. They fought everyone who encroached on it - Boers, British, Swazis, Arab slave traders, and others.

As a consequence, the Marota, as the Bapedi are affectionately addressed, were the de facto rulers of a great empire that included people of other origins, including the Bakgaga, Batau, Bakone, Baroka, Batlokwa, Baphuthi, Bakwena, Bakgatla, Bantwane, BaMongatane, BaMohlala, Mapulana, Matebele, Matlala, Batswana, MaSwazi, Batswako and others. They all owed allegiance and had a common loyalty to the Pedi kings. They even requested initiation sessions from the Pedi kings. So it is clear that, "historically the Pedi were a relatively small tribe who by various means built up a considerable empire. This resulted in their language being accepted as a lingua franca and indeed, with minor adjustments, as the medium for Bantu schools in most of the Transvaal." (Monnig, 1967: v as Cited by Gudani (2021)).

"Initially they were small and weak, but they soon began to establish their authority over a number of other Sotho groups and started to play a dominant role in the area. The basis of the Pedi power was laid by King Thulare (1780-1820). Thulare was a fearless warrior and a wise statesman." (Van Aswegen, 1990:p63 as Cited by Gudani (2021)) The Bapedi, like any other tribe, had their kings and royalty, their succession struggles and a powerful culture and tradition.

"The Pedi owned large herds of cattle and were skilful manufacturers of iron tools." (Van Aswegen, 1990:63 as Cited by Gudani (2021)) It is because of their dependence on cattle for their everyday livelihood, that cattle imagery dominated their language in idioms, praise songs, poetry and speech. Cattle represented a concrete expression of Pedi wealth. They therefore dominated such ceremonies and intra- and inter-tribal matters as funerals, marriage, initiation, court fines, song, ancestor worship and traditional rituals.

This dominant role of cattle had a material background in that the Bapedi depended on them for almost everything from ceremonies to building relations, clothing (cow hide), shoes, meat, milk, go kgopha (polish). The Sepedi word for cow and cattle, kgomo and dikgomo, literally dominates the interactions of Bapedi life. They held dikoma, had dikgoro, pitso, moshate, dibego, malapa, mashemo, diruiwa, dingaka, bahlabani and worshiped God through badimo.

They had a fairly democratic and egalitarian society. They had laws, rules and practices that were adhered to, and punished those who transgressed. As Lerumo says, "The African political and judicial structure was essentially democratic. Important decisions affecting the tribe were referred to a general assembly of the people - the Tswana and Sotho pitso, the Xhosa and Zulu imbizo. The Chief's court, at which disputes were tried publicly and every man had the right to attend and speak, was the pivot of the legal and political structure." (Lerumo, 1971:p3 as cited by Gudani (2021)) In their praise poem the Bapedi talk about their own origins, strengths and tribulations: "Rena re Bakgatla ba dithebe. Re boa Mohlake, Mohlaka Marole, Mohlopi wa Mmasebutla sa Dimo Seolomathebo, Wa naka dira le magodu. Nna re bowa phooko le phookwane, Mabje-maramaga mabje magolo ka mabedi e kago mae a tshilwane. Re Bahlako ba Raphogole 'a Ngwato. Rena re Marota 'a Mahwibidu, digolokwane tsa Tsate, dibolaya diipolaela, boba tsa Mohlaka." (Phala, 1935:p88 as cited by Gudani (2021)).

In recent historical period, before most of the Sekhukhune District area was turned into mining sites, it had been occupied by Pedi speaking communities (see Hammond-Tooke, 1993 as cited by Gudani (2021)). Early and Late Iron Age farming communities occupied the region since the first Millennium AD (also see Huffman 2002: 1-22 as cited by Gudani (2021); Hammond-Tooke 1993 as cited by Gudani (2021)). Archaeological studies conducted in the region also show that the Stone Age hunter-gatherer communities were present in this region for thousands of millennium before the present time.

The dominant religious belief in the communities is Christianity. A number of churches exist in the community. A strong culture of community identity exists amongst the local community, together with long-standing connectedness with the environment.

8.2. Description of the Current Land Uses

The current land use on site is mining related. Surrounding the site is industrial, other mining activities and agriculture (with a few residences associated with it). Further afield there are formal residential areas. The pre-mining land use for the underground mining area is unknown (the mine has been in operation since the 1970’s) but potentially was agriculture, specifically grazing due to the mountainous terrain. At Klarinet opencast the land use pre-mining was natural veld with a potential land capability class of wilderness. Land use surrounding the site is mining, agricultural (with private residences) and further afield formal residential areas. Land use features are indicated in Figure 8-29.

8.3. Description of Specific Environmental Features and Infrastructure on the Site

8.3.1. Environmental features

In terms of the Department of Environmental Affairs and Tourism (DEAT) guidelines for Integrated Environmental Management (IEM), sensitive landscapes are a broad term applying to: Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoon, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species Unstable physical environments, such as unstable soil and geo-technically unstable areas Important nature reserves – river systems, groundwater systems, high potential agricultural land Sites of special scientific interest Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites and Green belts or public open space in municipal areas.

As a desktop exercise, sensitive areas were identified using the information from the Screening Tool compiled in 2020 (www.enviornment.gov.za) and a composite map indicating very high and high sensitivity areas are presented in Figure 8-24 and the overall sensitivities for the environmental themes are provided in Table 8-6.

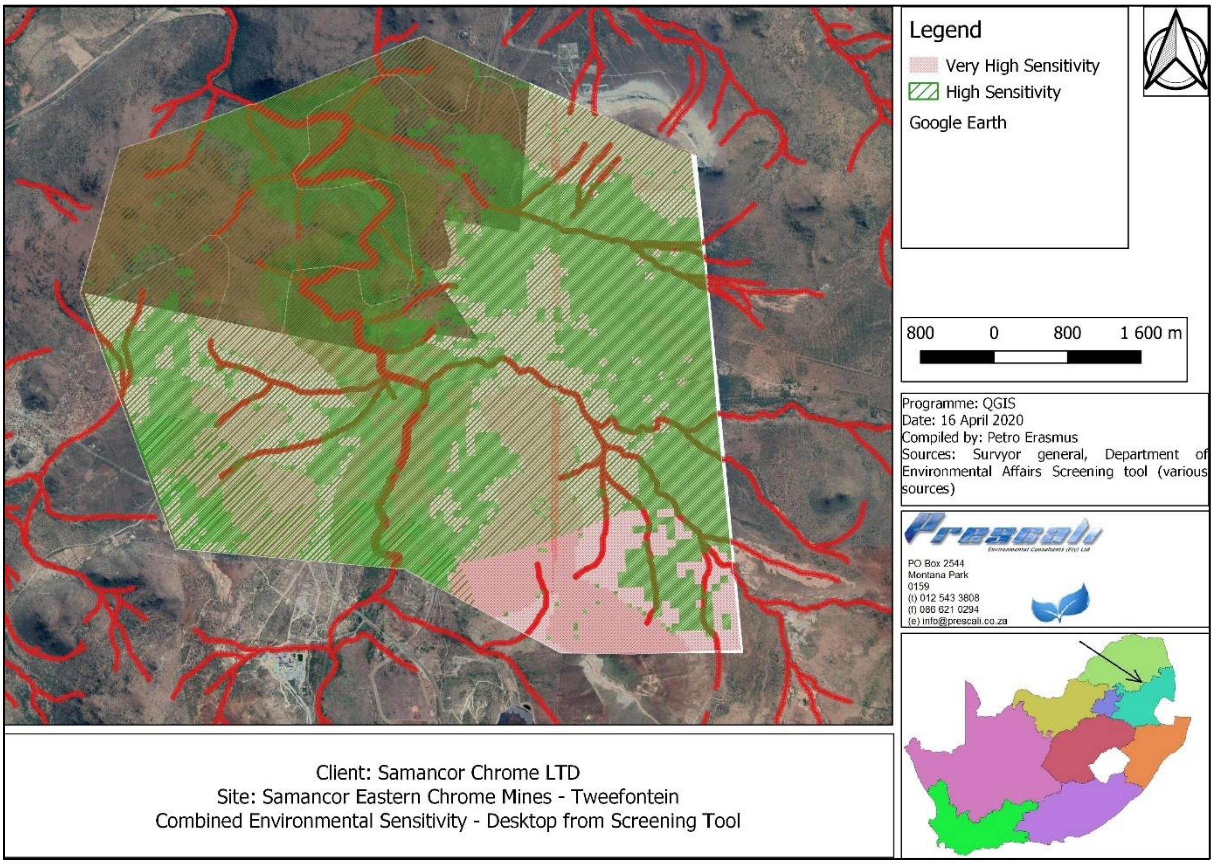


Figure 8-24: Sensitive environmental features as per the Screening Tool

Table 8-6: Summary of environmental sensitivities as per the 2020 Screening tool

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		
Plant Species Theme		X		
Defence Theme				X
Terrestrial Biodiversity Theme	X			

The above was expanded on and fine tuned (for the proposed expansion areas) in the 2020 specialist assessments conducted and the following sensitive areas were identified as discussed below.

8.3.1.1. Air quality receptors

Sensitive receptors in the immediate vicinity of Tweefontein Section are the town of Steelpoort and various informal settlements as indicated in Figure 8-25.

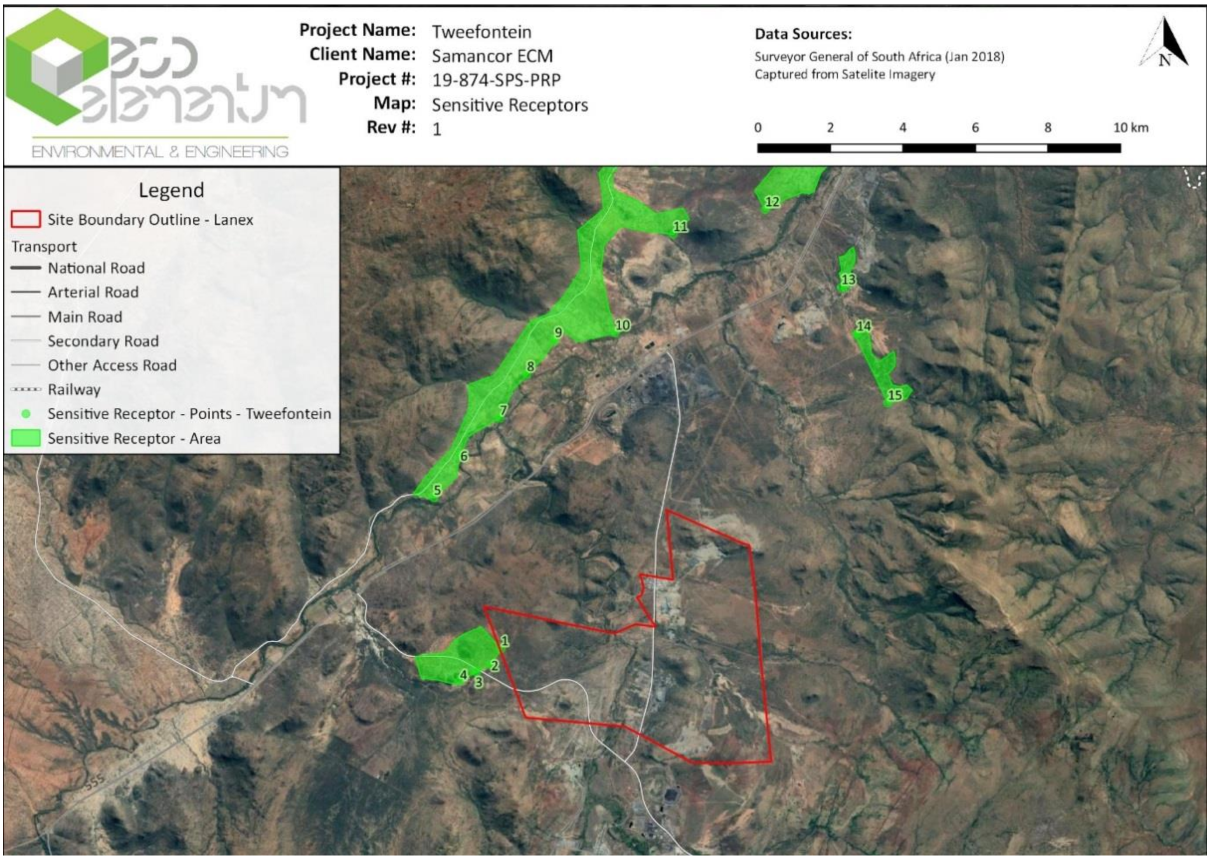


Figure 8-25: Air quality related sensitive receptors

8.3.1.2. Heritage resources sensitivity

Heritage resources with a low to high sensitivity were identified on site and are described in Section 8.3.1.2.

Figure 8-26: Sensitive Heritage resources

8.3.1.3. Terrestrial Ecological resources sensitivity

Reference is made to the desktop assessment for the site as indicated in Figure 8-24. For the sites assessed in 2020 (Red Kite Environmental Solutions, 2020) the following sensitivities were assigned based on the identified vegetation unit (Figure 8-12):

- ***High sensitivity***: VU1 this area consist of low to moderately disturbed bushveld vegetation, moderate floral diversity and species of conservation concern were observed. This area is also situated in the Sekhukhune Mountain lands (MP 9) which is classified as Endangered. A variety of micro habitats and flat rocky outcrops which may provide suitable habitat for Species of Conservation Concern occurs here.
- ***Medium Sensitivity***: VU2 consists of highly disturbed bushveld vegetation.
- ***High Sensitivity***: Watercourses (VU3): According to the National Water Act, 1998 (Act No. 36 of 1998), riparian areas are classified as a water resource and are therefore considered to be sensitive.
- ***Low Sensitivity***: VU4 are totally disturbed and cannot be considered sensitive.

8.3.1.4. Noise receptors

Residential areas and potential noise-sensitive developments/receptors/communities were identified up to a distance of up to 1,000 m (recommendation SANS 10328:2003) from the 2020 development footprint areas. These receptors are highlighted in Figure 8-27 however, the status of NSD04 was not defined, as a sign on the locked gate indicated that the dwelling may be used as a local Quarantine Centre for the area during the COVID-19 pandemic.

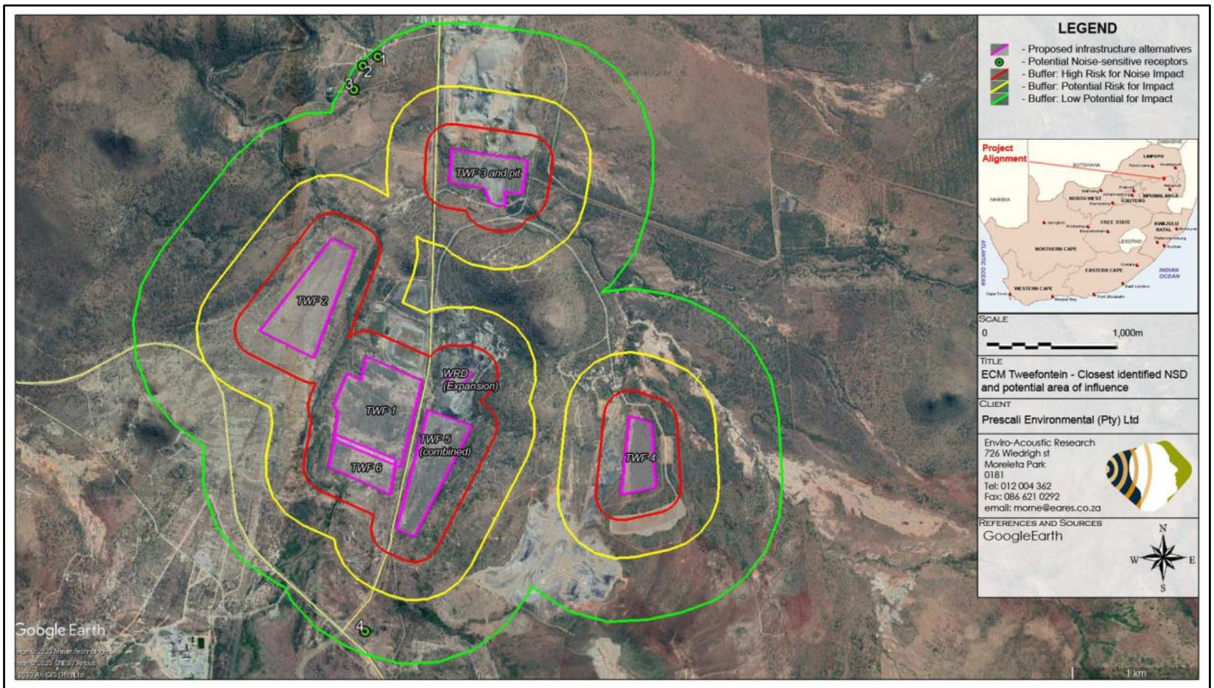


Figure 8-27: Noise sensitive receptors

8.3.1.5. Agricultural resources sensitivity

As per the Screening tool the entire Tweefontein section is classified as high to medium potential, during the assessment done in 2020 for the expansion areas the following conclusions were made:

- ***Entire low sensitivity***: This is applicable to the WRD expansion area, TWF1 combined, TWF3, TWF4, TWF5 and TWF6 footprint areas as a result of mostly low potential soil forms (Ms, Gs, Ag and WB), as well as loss of topsoil and restricted soil depth of less than 30 cm. In addition erosion was also observed. TWF2 was not assessed as it was not one of the preferred site for the new TSF.

8.3.1.6. Surface water sensitivity

Rivers, wetlands and other water bodies consisting of rivers with a potential zone of influence buffer of 32 metres on each side from the banks of the rivers, wetlands with a potential zone of influence of 10 metres from the edge of the wetlands and dams with a potential zone of influence of 10 metres from their high-water lines are considered to be high sensitive areas (refer to Figure 8-28). This is due to the fact that the interconnectivity of these sensitive areas creates greenway corridors that consist of networks of linked landscape elements that provide ecological, recreational, and cultural benefits to a community. (Forster, N., DeMeo, T., & Ditto, N.D., 1995 as cited by (Prescali Environmental Consultants, 2020)). This sensitivity was fined tuned for the proposed expansion areas and the results are indicated in Table 8-7.

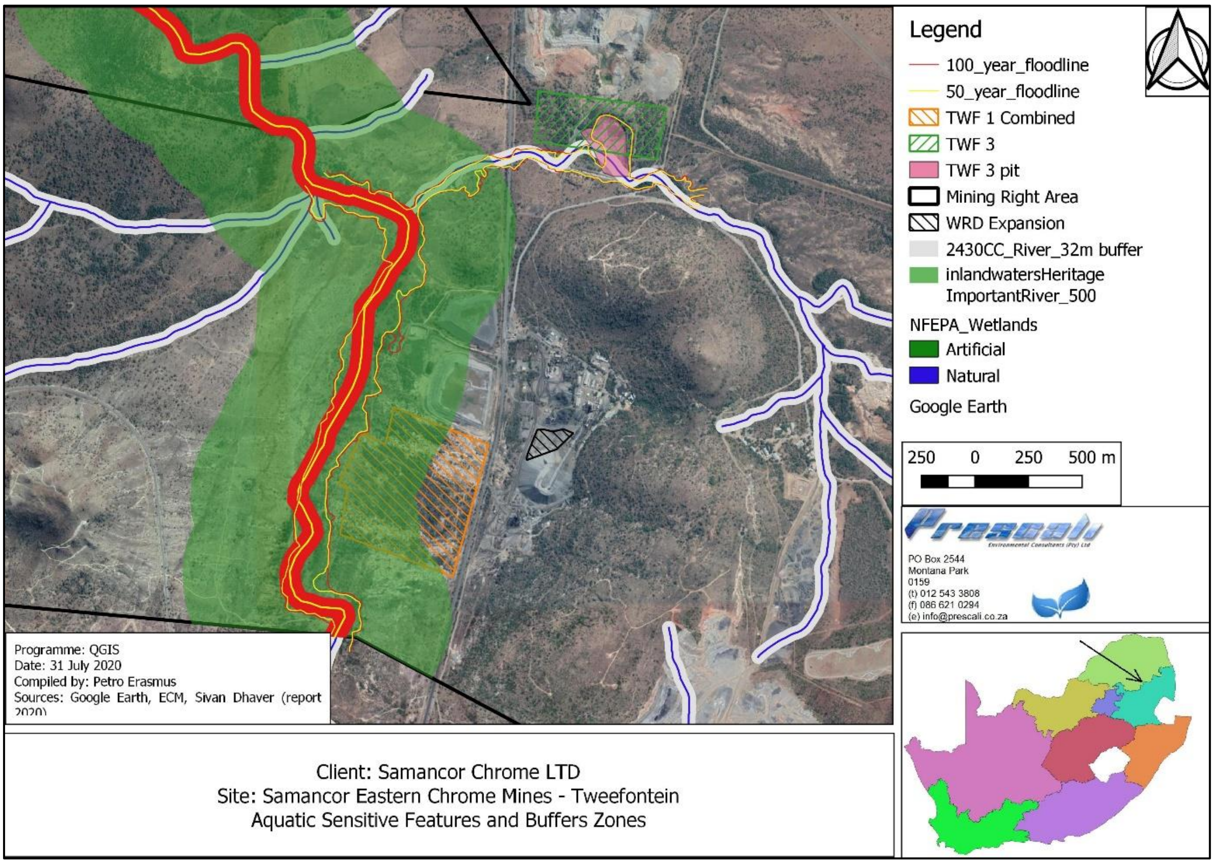


Figure 8-28: Identified sensitive features (surface water related) and buffer zones

Table 8-7: Results of the Screening Tool Assessment for Aquatic Biodiversity

Site	Screening tool	Final sensitivity
WRD Expansion	Low sensitivity	Low sensitivity The WRD expansion area is not located within 100 m from any watercourse and storm water management infrastructure is in place to capture any dirty storm water from this area and report it to the existing Return and Storm water dam complex.
TWF 3 and historic pit	Low sensitivity	High sensitivity Though the unnamed tributary of the Dwars River has been diverted it still functions to connect upstream and downstream areas. Portions of the reach show signs of

Site	Screening tool	Final sensitivity
		erosion and debris e.g. pipes were noted in the watercourse itself.
TWF1	High sensitivity	High sensitivity This potential TSF site is located outside the 1:100 year flood line. The affected watercourse (Dwars River) is perennial and though there are upstream anthropogenic impacts e.g. bridge and dam, none was observed along the affected reach.

8.3.1.7. Geohydrological sensitivity

The aquifer at Tweefontein Section is classified as having a medium vulnerability and a medium level of groundwater protection is required.

8.3.1.8. Visual receptors

From a visual aspects visually sensitive areas are areas in the landscape from where the visual impact is readily or excessively encountered. Sensitive receptors are indicated in Figure 8-25 and consists of human habitation areas especially the town of Steelpoort to the north-east of the Tweefontein section and various informal settlements to the north and west of the Tweefontein Section (EcoElementum Environmental and Engineering, 2020). The GIS analysis predicted that none of the sensitive receptor locations would be able to see the new expansion structures. It should however be noted that this is not a rating visual quality, rather it is used to determine the likelihood that the proposed infrastructure will be visible. It does however not take into account real time factors like micro scale vegetation cover.

8.3.2. Infrastructure on site

Tweefontein Section is an operational mine and infrastructure on site includes:

- Roads;
- Pipelines;
- Electricity lines;
- ROM and tailings retreatment plants (various);
- WWTW;
- Offices;
- Workshops;
- Two existing TSFs;
- Various storm water infrastructures;
- WRD;
- Various opencast areas;
- Various underground mining areas and vents.

A summary of key infrastructure and current activities is provided below.

Aspect	Method/system
Mining Division	
Mooigenoeg and Tweefontein underground	The mining methods currently employed comprise conventional up-dip and breast methods and mechanised breast methods. Current mining and future mining, is at depths ranging from 30 to 150 m below surface.
Klarinet opencast	Mining at the Klarinet opencast has currently ceased. This opencast has been backfilled as far as possible and final profiling, topsoil placement and vegetation establishment have not been implemented.
Hoogenoeg Opencast	This opencast has been backfilled as far as possible, but final profiling, topsoil placement and vegetation establishment are outstanding.

Aspect	**Method/system**
Process Division: Beneficiation	
ECM plant	ROM ore is crushed to size at the plant and a certain percentage may be milled further. The ore is then sorted into different size fractions by means of a dense media separation process. Silica is removed from the finer fractions by means of gravity and elutriation separation techniques though further screening may be needed for specialised grades. The plant generates the following chromite ore products: • Lumpy: < 80 mm + > 15 mm; • Small Lumpy: < 15 mm + > 6 mm; • Chips: < 6 mm + > 1 mm; an • Fines: < 1 mm. Final products are stored on concrete floors prior to shipment.
Tailings retreatment plant	Tailings from the ECM plant is pumped to the Retreatment plant for further processing that produce the following product: • Chromite concentrate; and • PGM concentrate.
Minprotech retreatment plant	Tailings from the Retreatment plant are pumped to the Minprotech Retreatment plant for further processing which produce Chromite concentrate product.
Water and Waste Management	
Water supply	Tweefontein sources its potable water from boreholes 2, 4, 5, and 6 and a total amount of 368 185 m^3/a has been authorised to be abstracted from these boreholes. At Klarinet opencast area, potable water is sourced from a borehole (Klarinet borehole) with an authorised amount of 279 m^3/ a.
Waste rock dump (WRD)	The existing waste rock dump area covers an area of 46 366 m^2 and has a capacity of 834 588 tons. The waste rock has been assessed as a Type 4 waste in terms of the National Environmental Management Waste Act (NEMWA). As part of the 2020 EMPr amendment, the capacity of the WRD will be expanded by an additional 453 000 m^3 which will extend the life of the WRD by approximately 48.5 months.
Return Water Dam	Currently there is one operational return water dam with two compartments that is / will be lined with a single, 1.5 mm thick HDPE liner. A Penstock silt trap is located directly downstream of the Tailings dam 2 and has been lined according to the DWS standards as part of the TSF construction. The return water dam has a capacity of 50 000 m^3. A new Return water dam will be constructed as outlined in Section 6.
TSF Complexes	The Tweefontein TSF Complex comprises of the historic pit 1 and tailings dam 1 and 2. Currently Tailings Dam 1 is dormant and tailing dam 2 is operational. tailings dams 1 and 2 have the capacity of 587 340 m^3 and 1 894 737 m^3 respectively. Tailings has been assessed as a Type 3 waste (due to manganese concentrations) using the Total concentration leachate procedure (TCLP). A new tailings dam will be constructed as outlined in Section 6.
Domestic and industrial waste	Domestic waste generated on site is collected by the appointed contractor who disposes the waste at the Local Municipality landfill site. Hazardous waste generated on site is collected by the appointed contractor who disposes the waste at Holfontein site.

Aspect	Method/system
	Industrial, hazardous and contaminated waste is transported to the sorting site. Scrap metal, electric cable and used conveyor belts are weighed separately and transported to site or recyclers.
Sewage handling	Domestic wastewater is generated at the underground and opencast areas, office areas, plant area and tailings area through use of the ablution facilities and kitchens. Domestic wastewater includes shower water, water disposed into sinks following use for domestic purposes, and sewage. Sewage is managed through two WWTW's (WWTW1 located at the mining offices and WWTW2 located at the plant area) and various septic tanks (Klarinet septic tanks 1 and 2, Tailings dam site offices septic tank (no longer in used and currently using portable toilet) and Tailing Retreatment plant septic tank). The WWTW1 replaced the then existing four dam oxidation pond system. One historic dam no. 2 was kept acting as an evaporation dam for the treated effluent. This facility is lined. Treated effluent from the WWTW at the mining offices is evaporated, whereas as effluent from the WWTW at the plant is released into the return water dams for reuse at the plant.
Stormwater management:	Stormwater management caters for both clean stormwater runoff, and dirty stormwater runoff. However, stormwater management infrastructure in some areas (especially at the eastern and higher lying side of the mine) were found to be inadequate. Dirty water runoff is collected on site and stored in the existing return water dam for reuse in the process operations.

8.4. Environmental and Current Land Use Map

(Show all environmental, and current land use features)

Current land use was delineated using Google Earth and information from the surveyor general. Generally land uses are:

- Wilderness (natural environment) – all areas not classified as mining, residential or roads;
- Mining;
- Residential; and
- Roads.

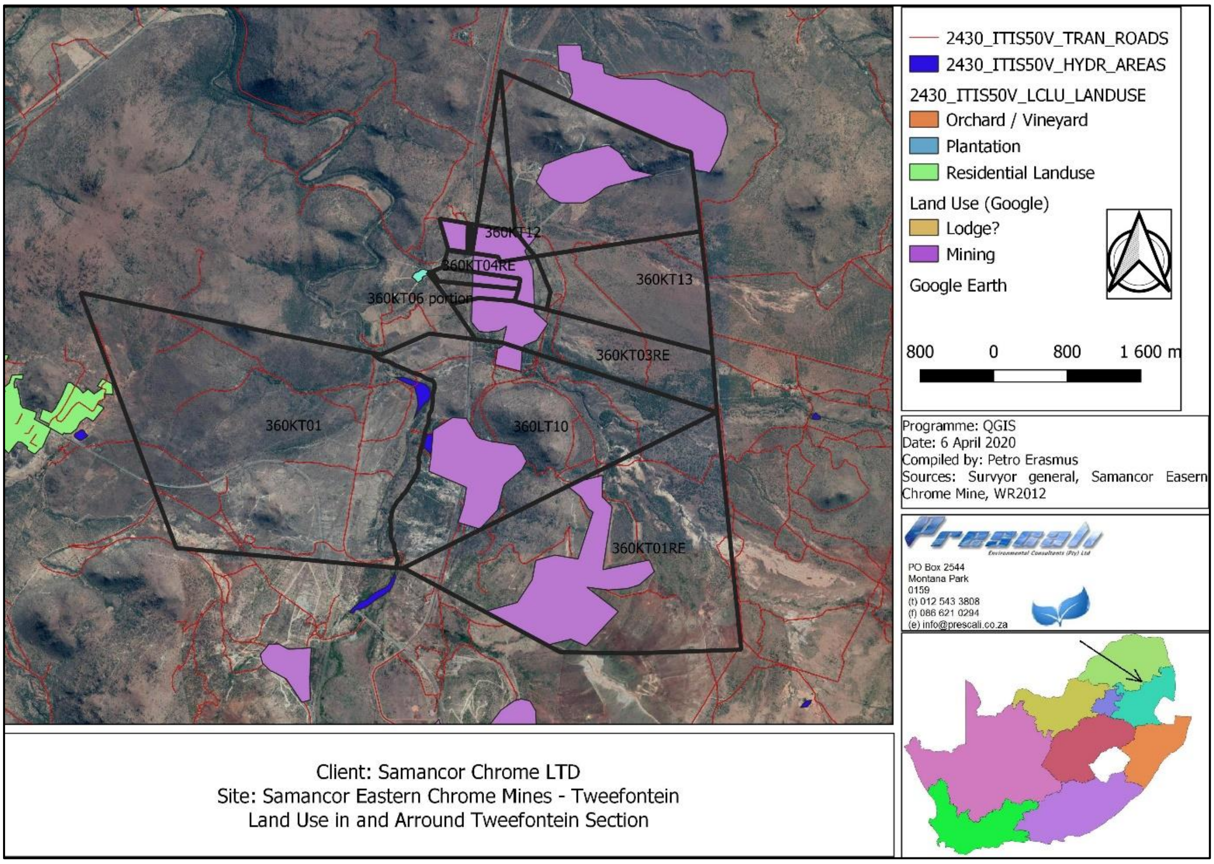


Figure 8-29: Environmental and current land use features map

9. IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT

9.1. Impacts Identified

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

9.1.1. 2020 Expansion activities

The potential impacts that could occur as a result of the 2020 expansion activities (TSF, RWD and River diversion construction, WRD expansion) were initially rated specifically with the assumption that no mitigation measures were applied and was re-assessed following the implementation of management and mitigation measures. The potential impacts and key issues was thoroughly investigated during the EIA phase and include the following:

- Public participation;
- Heritage assessment;
- Geo-hydrological studies;
- Surface water assessment;
- Fauna and flora assessment;
- Soil assessment;
- Archaeological assessment;
- Noise assessment;

- Visual assessment; and
- Air quality assessment.

The results of the assessments are summarised in Table 9-1 and the assessment of the impacts are provided in Table 17-1.

9.1.2. Historical and current operational activities

The impacts identified for the historical and existing activities as outlined in the latest approved EMPR (2013) which was a consolidation of previous EMPr's is also indicated in Table 9-1 to allow for the consolidation of all the approved addendums to the original EMPr and the assessment of the impacts are provided in Table 17-1**.**

Table 9-1: Identified impact and associated activities

Year	Activity	Potential Impact	Aspects affected
2020	New TSF at TWF3 and old pit	Development related activities will lead to destruction of highly sensitive habitat (VU1) and overall loss of biodiversity within the clearance area. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Flora
2020	New TSF at TWF3 and old pit	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	Flora
2020	New TSF at TWF3 and old pit	Development related activities may lead to the loss of floral species of conservation concern. Sixty-one (61) plant species listed on the SANBI database for the area are classified as species of conservation concern (SCC) according to the IUCN Red List status, the ToPS list, their endemism, the NFA and the LEMA. Six plant SCC were identified to occur on the proposed project footprint during the site survey. Development and related activities are likely to impact on the sensitive habitats related to the watercourses situated in and around the development footprint.	Flora
2020	WRD expansion	The WRD extension is largely planned on an area which forms part of VU4, which is highly degraded. Development related activities will not lead to significant destruction of habitat and overall loss of biodiversity.	Flora
2020	WRD expansion	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	Flora
2020	TWF3 and pit tailings dam	TWF3 (where the opencast exists and will be backfilled) will suffer less severe ecological impacts due to the impacted nature of the area inside the existing mine. This activity could fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds.	Fauna
2020	TWF3 and pit tailings dam	Constructing activities and heavy construction vehicles entering into natural areas might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat	Fauna
2020	TWF3 and pit tailings dam	Possible impacts on Species of Conservation Concern (SCC) associated with the area is a possibility, specifically if TSF1 is the chosen alternative. However, no nationally red listed species were observed during the field assessment, but is could still occur based on the condition of the habitat observed. Provincially listed species	Fauna

Year	Activity	Potential Impact	Aspects affected
		have been noted and impacts to these should be prevented and no hunting, catching or relocation of any species should occur without authorisation under LEMA. The expansion of the WRD is not expected to bring forth ecological impacts, since the area designated for development falls within the dirty footprint where the WRD already occurs.	
2020	TSF and WRD development	Impacts to the wildlife during the operational phase of the TSF and WRD developments could occur, depending on alternative utilized. TSF1 will have more severe ecological impacts than TSF3 and the expansion of the WRD. The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. The impacts are foreseen to be less severe than Construction phase, the threat of this stage is not the magnitude of the impact, rather the duration. This continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).	Fauna
2020	WRD Expansion	The construction activities might result in impacts on the natural environment, however, the footprint proposed for the WRD has been already developed and fall within a designated fenced area. The remaining natural environment within these areas were found to be already impacted as the current WRD is already located here.	Fauna
2020	WRD Expansion	Traffic and constant usage of heavy vehicles might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat. However, the area had already been fenced and occurs within an already impacted footprint, therefore, the occurrence of animal species and usable habitat within this area is not expected and impacts will remain low.	Fauna
2020	WRD Expansion	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. Since this is the extension of the WRD, these are already present on site and will only continue.	Fauna
2020	Site clearance for WRD expansion and TSF development	During this activity, a number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above-mentioned operations will have its own duration and potential for dust	Air quality

Year	Activity	Potential Impact	Aspects affected
		generation. Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)) It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This activity will be short-term and localised, seizing after construction activities. Material will be removed by using a bulldozer and then storing this material separately for use during rehabilitation at end of life of mine when the operation cease. These construction sites are ideal for dust suppression measures as land disturbance from clearing and excavation generates a large amount of soil disturbance and open space for wind to pick up dust particles and deposit it elsewhere (wind erosion). Issues with dust can also arise during the transportation of the extracted material, usually by truck and shovel methods, to the stock piles. The dust can further be created by the entrainment from the vehicle itself or due to dust blown from the back of the bin of the trucks during transportation of material to and from stockpiles	
2020	Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, drilling, drilling blasting, etc.)	During this phase, it is anticipated there will be construction of infrastructure. This will include, access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust). The construction of roads take place through removing the topsoil and then grading the exposed surface in order to achieve a smooth finish for vehicles to move on. Temporary stockpiles will be created close to the edge of the road in order to be backfilled easily once the road has expired or need to be rehabilitated.	Air quality
2020	General transportation, hauling and vehicle movement on site	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator’s visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the	Air quality

Year	Activity	Potential Impact	Aspects affected
		deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	
2020	Dust from material handling and wind erosion from stockpiles (WRD and new TSF)	Increase in PM10 concentrations was not predicted to exceed 75 µg/m³ limit for any of the sensitive receptors. The annual average PM10 limit of 40 µg/m³ are predicted not to exceed at any of the identified sensitive receptors for the unmitigated or mitigated scenarios.	Air quality
2020	Dust from material handling and wind erosion from stockpiles (WRD and new TSF)	No sensitive receptors are predicted to exceed the monthly dust fallout for the highest month residential limit of 600 mg/m²/day. The predicted annual dust fallout for the unmitigated and mitigated scenarios are not predicted to exceed the annual limit of 300 mg/m²/day at any of the sensitive receptors	Air quality
2020	New TSF, WRD Expansion	Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture.	Flora
2020	New TSF, WRD Expansion	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area the same manner as may be expected in the construction phase, although these impacts are short term and followed by increased habitat restoration and decreased movement within the area. The possibility exists for rehabilitation to be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance.	Fauna
2020	Demolition and removal of all infrastructures including transportation of site	The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions. The impacts will be short-term and localised. Any implication or implications this phase will have on ambient air quality will seize once the activities are finalised	Air Quality
2020	Rehabilitation (Spreading of soil, re-vegetation and profiling / contouring)	During this activity, there is the reshaping and restructuring of the landscape. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Air quality
2020	Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	Noise

Year	Activity	Potential Impact	Aspects affected
2020	Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	Noise
2020	Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Surface water
2020	Storm water management for the new TSF and associated infrastructure	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.	Surface water
2020	Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	Noise
2020	Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	Noise
2020	Construction of the New TSF, TSF reclamation and WRD Expansion	Disturbance / Loss of the Soil Resource	Soils
2020	Ineffective housekeeping and management of stockpiles and exposed soils as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss of the Soil due to erosion as well as contamination	Soils
2020	Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Cumulative disturbance, loss and degradation of soils	Soils
2020	Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Increased / Decreased sediment loads on downstream systems	Soils
2020	Stripping of soils, Clearing of vegetation and stockpiling of materials as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss / Sterilization of inherent land capability and land use.	Land capability and land use
2020	Continued clearing, disturbance, laydown, stockpiling and	Loss of land services, ecosystems support and services	Land capability and land use

Year	Activity	Potential Impact	Aspects affected
	transportation as a result of TSF construction, TSF reclamation and WRD expansion		
2020	Access road and stream diversion construction activities	Disturbance / loss of soil resources	Soils
2020	Ineffective housekeeping and management of stockpiles and exposed soils as a result of the access road and stream diversion	Disturbance / loss of soil due to erosion as well as contamination	Soils
2020	Continued activities inclusive of mining and transportation as a result of the access road and stream diversion	Cumulative Disturbance / loss and degradation of soils	Soils
2020	Continued activities inclusive of mining and transportation as a result of the access road and stream diversion	Increased / decreased sediment loads on downstream systems	Soils
2020	Stripping of soils, clearing of vegetation and stockpiling of materials for road and river diversion	Disturbance / loss / sterilisation of inherent land capability and land use	Land capability and land use
2020	Continued clearing, disturbance, lay down, stockpiling and transportation for road and river diversion	Cumulative Disturbance / loss / sterilisation of inherent land capability and land use	Land capability and land use
2020	Vegetation removal	Vegetation removal (though already disturbed footprint area) could result in siltation of the watercourse should this activity occur during the rainfall season. As a result of the vegetation removal, the existing flow regime and micro habitats created by the existing diversion would be altered.	Surface water
2020	Vegetation removal	The potential for hydrocarbon spills from machinery working within 100 m from a watercourse is a possibility.	Surface water
2020	Diversion of the unnamed tributary around the new TSF and associated infrastructure	It is recommended that a formal river diversion be designed around the new footprint area of the TSF and associated infrastructure. This will have a positive impact on the flow regime, habitat, water quality and biota of the watercourse and allow for the connection of the upstream and downstream area.	Surface water
2020	Diversion of the unnamed tributary around the new TSF and associated infrastructure	Negative aspects associated with the construction of the proposed diversion may include siltation and temporary impacts on flow regime, habitat and biota.	Surface water

Year	Activity	Potential Impact	Aspects affected
2020	Diversion of the unnamed tributary around the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Surface water
2020	Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Surface water
2020	Storm water management for the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Surface water
2020	Construction of the TSF and associated infrastructure liner system	During construction of the TSF and associated infrastructure impacts on water quality due to siltation as a result of the loosening of material may occur. The potential impacts on the surface water quality could impact on the habitat and biota of affected watercourses.	Surface water
2020	Construction of the TSF and associated infrastructure liner system	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.	Surface water
2020	Operation of the TSF and associated infrastructure	No additional impacts on the flow regime is expected as it is covered in the storm water management required for the site. During the operational phase leachate from the TSF and associated infrastructure if the incorrect liner is installed or of the liner is damaged may impact on the baseflow water quality.	Surface water
2020	Operation of the TSF and associated infrastructure	Spills from the pipeline would result in impacts on the water quality (should the tributary be flowing at the time). If spills are not cleaned it could result in base flow water quality impacts. This in turn could impact on the habitat and the biota.	Surface water
2020	Operation of the TSF and associated infrastructure	TSF breaching could result in impacts on water quality, habitat and Biota should a break occur on the east, south or western sides of the TSF. The potential range of the impact has been modelled by Tailings solutions.	Surface water
2020	Backfilling of the historic pit area with Tailings	No liner is possible in the pit thus it will not be possible to reduce leachate to the baseflow of the watercourse. This will have an impact on the baseflow water quality of the watercourse and have a negative impact on the water quality in the Dwars river. Please also refer to the geohydrological assessment.	Surface water
2020	Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The increase in soil to act as a capping material may result in wind-blown dust and potential siltation that could impact on biota and the habitat. The vegetation of the TSF and associated infrastructure is a positive aspect.	Surface water
2020	Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	During the closure phase the movement of machinery may result in hydrocarbon spills that could impact on water quality, biota, habitat and vegetation.	Surface water

Year	Activity	Potential Impact	Aspects affected
2020	Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The potential of leachate generated by the TSF and associated infrastructure is still a possibility and could result on impacts on quality, biota and vegetation.	Surface water
2020	Re-mining of TSF facilities	Pumping of mobilised fines across the diverted tributary could impact on water quality, habitat and biota should a spill occur.	Surface water
2020	Re-mining of TSF facilities	Should the liner system be compromised as a result of the re-mining this could impact on the surface water quality, habitat and biota.	Surface water
2020	Construction of the new TSF and the WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	Visual
2020	Permanent nature of the new TSF and WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	Visual
2020	New TSF (TWF1 or TWF3 options)	Pollution Plume	Groundwater
2020	Existing TSF	Pollution Plume	Groundwater
2020	WRD	Pollution Plume	Groundwater
2020	Underground mine - planned, inclusive of surface facilities	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	Groundwater
2020	Underground mine - existing	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	Groundwater
2020	Underground mine - planned	Dewatering could result in < 1 m water level decline	Groundwater
2020	Underground mine - existing	Dewatering could result in < 1 m water level decline	Groundwater
2020	Cumulative of all activities	Pollution Plume	Groundwater
2020	TWF1 option	Potential impact on artefacts.	Archaeological
2020	Movement of trucks, excavators and other mining equipment.	Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active. The noise levels will increase to 90 - 100 dBA during day time (5h00 – 19h00). Rock breakers and blasting for the excavation during mining operations will generate noise levels of 100 – above 120 dBA respectively. The closest village (Mahlagari) to Tweefontein is 8 km away and less likely to be impacted due to it being further away from the site. Noise rating for activities similar to that proposed at Tweefontein mine vary between 50 dB (A) and 57.8 dB (A).	Socio Economic
2020	Cumulative of all activities	The noise impacts of the proposed Tweefontein Project and exiting Mahlagari village (08km) and retail/commercial activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	Socio Economic
2020	Movement of trucks, excavators and other mining equipment, including mining activities	Controlled movement of haul trucks and light delivery vehicles (LDVs) around the site will generate some nuisance dust into the atmosphere. Dust will also be generated	Socio Economic

Year	Activity	Potential Impact	Aspects affected
		from the opencast pits, access roads to and from the open pits and crusher/plant sites.	
2020	All	Cumulative impact on air quality	Socio-Economic
2020	All	Visual impact will result from the visual contrast of the site with the surrounding areas due to the following factors: § The crushing and screening activities create a high visual contrast with the surrounding areas, which are greener and less uniform. In the first phase of rehabilitation, trees and natural vegetation will be used to disguise or buffer the mine workings as far as possible and provide some degree of stabilization of the substrate; § The position of the mine workings, tailings storage facility and waste rock dump above the R555 Road, which raises it above the level of any naturally occurring tree, making it more visible; § The relatively undeveloped nature of the surrounding area immediately reveals the presence of man-made infrastructure and man-made forms (straight lines, bold colours etc.) The proposed SECM Tweefontein opencast activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine will be visible from R555 main road.	Socio Economic
2020	All	The proposed additional mining infrastructure at Tweefontein Mine may form part of the “sense of place” in the long term, even after operations cease.	Socio Economic
2020	All	The construction and expansion of the Tweefontein mine surface infrastructure including crushing and screening plant, tailings dam, waste rock dumps, access roads and opencast pits will require topsoil stripping and clearing of vegetation. The inherent land capability will be permanently lost below the footprint of these mining entities. The severity of the impact is considered to be of moderate to high significance. The reason for the moderate severity is that the land is zoned for mining and currently being mined by SECM. The proposed opencast pits and mining infrastructure will not alter the land use at the mine footprint due to current mining activities at the Tweefontein mine. The additional mining infrastructure will add to the existing impacts of air pollution due to dust, visual impacts, and extraction of water for mining purposes due the existing mining operations. There is no major impact on the land use since the area is already zoned for mining. The positive impact of mining in the project area include increased business opportunities, greater demand for goods and services, pressures for housing (ability to own houses), etc.	Socio Economic

Year	Activity	Potential Impact	Aspects affected
2020	All	Cumulative impacts on land use due to secondary industries that may be developed around the areas to provide support services and material to the mine. Urbanization and modern residential developments also likely.	Socio Economic
2020	TSF and WRD development	Three (3) archaeological sites were identified in the TSF1 area during the September 2020 (A. Pelser) fieldwork, dating to the Stone- and Iron Age periods, but there is a high likelihood that more are located in the TSF1 area and in the expansive erosion donga that is partially situated within the area and bordering the area. It is therefore important that the TSF1 area be studied in more detail as part of Phase 2 Archaeological Mitigation before mining activities commence. TSF1 is not the preferred site for the proposed tailings facility and therefore the said three sites will not be impacted on.	Socio Economic
2020	All	Any further mining development will form part of the history of the local area. No other cumulative impacts are anticipated.	Socio Economic
2020	All	Crime is commonly in most settlement areas and the community of Mahlagari is not different. However, due to the rural nature of the settlements, crime may be lower comparative to urban centres such as Burgersfort. The traditional livelihoods and sharing of communal resources in rural settlements also minimizes crime to some extent. Crime and HIV statistics in Mahlagari village have NOT been verified in this SEA study, however as a general norm influx of foreign people and job seekers in communities adjacent to large scale projects such as the Tweefontein mine project is inherent. HIV and crimes such as theft, sex crimes, traffic violations, fraud and drugs are possible, and likely to increase if not managed and policed because of the Tweefontein mine project. Influx of foreigners and job seekers and increase in disposable income for local people may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Socio Economic
2020	All	Cumulative impact on Crime, Covid-19 and HIW	Socio Economic
2020	All	Mahlagari village is a village in Steelpoort and the closet and most likely to be affected by to the Tweefontein mine project. It is characterized by rural to semi-rural settlements with high levels of poverty and high unemployment levels as well as low literacy levels. The region's economy is derived from a variety of sectors, of which mining and agriculture are the main contributors. A high percentage of residents in the local village of Mahlagari are unemployed. The mine will alleviate this unemployment problem, though it will not eradicate it completely. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The life of mine (LOM) is expected to	Socio Economic

Year	Activity	Potential Impact	Aspects affected
		be over 20 years, which translate to 20 years and more of economic activity in the region. The social and labour plan (SLP) to be implemented by the SECM Tweefontein Project will contribute to the development of the adjacent community in terms of skills training, local economic development projects, and improved infrastructure.	
2020	All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Crime impacts	Socio Economic
2020	All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Employment impacts	Socio Economic
2020	TSF operation	Potential loss of resource and life should TSF dam failure occur on northern wall	Socio Economic
2015	Opencast mining and underground mining areas	Loss of chrome resource	Geology
2015	Opencast mining areas	Voids left as a result of chrome removal at Opencast areas	Topography
2015	All	Impact on pre-mining and operational topography	Topography
2015	All	Loss of topsoil during stripping, handling and placement on rehabilitated areas	Soils
2015	All	Loss of topsoil fertility as a result of changes to the physical, chemical and biological soil properties which could affect the potential land use	Soils
2015	All	Contamination of soils by fuels and lubricants from mining and associated equipment	Soils
2015	All	Change of land use from wilderness to mining and back to wilderness	Land capability
2015	All	Impact on wilderness land used for mining activities	Land use
2015	Opencast mining and underground mining areas	Management of un-mined land at Tweefontein	Land use
2015	All	Loss of rare plant species that occur on site	Natural vegetation / plant life
2015	All	Growth of alien invasive plant species on site	Natural vegetation / plant life
2015	All	Loss of species diversity and habitat characteristics due to mining	Natural vegetation / plant life
2015	All	Loss of indigenous animals	Animals / Fauna
2015	All	Reduction in surface water quantity (volume of water to the receiving environment)	Surface water
2015	All	Impact on surface water quality	Surface water
2015	Opencast and underground mining	Alteration of the natural river / water courses	Surface water
2015	All	Lowering of groundwater levels due to mining related activities	Groundwater

Year	Activity	Potential Impact	Aspects affected
2015	All	Negative impact on groundwater quality as a result of mining activities and tailings dams	Groundwater
2015	Operation of TSF facilities	Elevated water levels due to recharge from tailings dams	Groundwater
2015	All	Impact on air quality as a result of operation dust and gaseous emissions	Air quality
2015	Opencast mining	Mining operations within open pit area will impact on Dust fallout (nuisance dust)	Air quality
2015	Processing plans, stockpiles, opencast and underground mining	Material handling operations will impact on Dust fallout (nuisance dust)	Air quality
2015	Processing plants	Crushing will impact on Dust fallout (nuisance dust)	Air quality
2015	All	Vehicle entrainment on unpaved roads will impact on Dust fallout (nuisance dust)	Air quality
2015	All	Vehicle entrainment on paved roads will impact on Dust fallout (nuisance dust)	Air quality
2015	All	Continuous rehabilitation activities will impact on Dust fallout (nuisance dust)	Air quality
2015	TSFs	Wind erosion from tailings dam will impact on Dust fallout (nuisance dust)	Air quality
2015	Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Dust fallout (nuisance dust)	Air quality
2015	Overburden and WRD	Wind erosion from overburden / waste rock storage pile will impact on Dust fallout (nuisance dust)	Air quality
2015	ROM Stockpiles	Wind erosion from ROM storage piles will impact on Dust fallout (nuisance dust)	Air quality
2015	Opencast mining	Drilling and blasting activities – opencast will impact on Dust fallout (nuisance dust)	Air quality
2015	Opencast mining	Mining operations within open pit area will impact on Respirable dust (PM10)	Air quality
2015	Processing plants and opencast mining, stockpile areas	Material handling operations will impact on Respirable dust (PM10)	Air quality
2015	Processing plant	Crushing will impact on Respirable dust (PM10)	Air quality
2015	All	Vehicle entrainment on unpaved roads will impact on Respirable dust (PM10)	Air quality
2015	All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	Air quality
2015	All	Continuous rehabilitation activities will impact on Respirable dust (PM10)	Air quality
2015	Tailings dams	Wind erosion from tailings dam will impact on Respirable dust (PM10)	Air quality
2015	Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Respirable dust (PM10)	Air quality
2015	Overburden and WRD	Wind erosion from overburden / waste rock storage pile will impact on Respirable dust (PM10)	Air quality
2015	ROM stockpiles	Wind erosion from ROM storage piles will impact on Respirable dust (PM10)	Air quality
2015	Opencast mining	Drilling and blasting activities – opencast will impact on Respirable dust (PM10)	Air quality
2015	Opencast mining	Blasting of overburden and reef will impact on Gaseous emissions	Air quality
2015	All	Release of exhaust emissions from vehicles on paved and unpaved roads will impact on Gaseous emissions	Air quality
2015	Underground mining	Release of underground emissions due to diesel operating machinery will impact on Gaseous emissions	Air quality

Year	Activity	Potential Impact	Aspects affected
2015	All	Increased noise levels as a result of the mining activities above acceptable levels	Noise and Vibration
2015	Opencast mining	Risk to humans and equipment as a result of fly rock	Noise and Vibration
2015	All	Sensitive landscapes present in the vicinity of Tweefontein are the Steelpoort River and Dwars River floodplains and riparian zones.	Sensitive landscapes
2015	All	Visibility of the mining activities may impact on the sense of place, visual equity	Visual aspects
2015	Opencast mining	Damage to the village from the recent past	Archaeological and cultural interest
2015	Opencast mining	Graveyard may be damaged by mining operation	Archaeological and cultural interest
2015	Opencast mining	Destruction of mining heritage remains	Archaeological and cultural interest
2015	All	Influx of job seekers into the area	Socio-Economic structure
2015	All	Impact on community safety as a result of mining activities	Socio-Economic structure
2015	All	Increase in Social pathologies due to influx of job seekers	Socio-Economic structure
2015	All	Accommodation and social services limitations	Socio-Economic structure
2015	All	Road maintenance and safety	Socio-Economic structure
2015	All	Safety of Children	Socio-Economic structure
2015	All	Aesthetics and impacts on sense of place	Socio-Economic structure
2015	All	Potential Health impacts	Socio-Economic structure
2015	All	Influx of job seekers into the area	Socio-Economic structure
2015	All	Employment and income generation	Socio-Economic structure

Year	Activity	Potential Impact	Aspects affected
2015	All	The use of current employees as construction workers	Socio-Economic structure
2015	All	Increase in indirect employment opportunities and local expenditure	Socio-Economic structure
2015	All	local and regional economic benefits and multipliers	Socio-Economic structure
2015	All	Growth in the local housing sector	Socio-Economic structure
2015	All	Development of BEE and SMME opportunities	Socio-Economic structure
2015	All	Corporate and social investment	Socio-Economic structure
2015	All	No additional impacts expected	Geology
2015	All	No additional impacts expected	Topography
2015	All	No additional impacts expected	Soils
2015	All	No additional impacts expected	Land capability
2015	All	No additional impacts expected	Land use
2015	All	No additional impacts expected	Natural vegetation / plant life
2015	All	No additional impacts expected	Animals / Fauna
2015	Opencast mining	Effect of final void on catchment yield	Surface water
2015	All	Effect on surface water quality	Surface water
2015	Opencast and underground mining	Possibility for Decant from mining operations	Groundwater
2015	TSFs	Elevated water levels due to recharge from the tailings dam	Groundwater
2015	TSFs	Nitrate pollution from migration from tailings dam	Groundwater
2015	Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on dust fallout (nuisance dust)	Air quality
2015	Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on dust fallout (nuisance dust)	Air quality
2015	All	Infrastructure removal will impact on dust fallout (nuisance dust)	Air quality
2015	All	Vehicle entrainment on unpaved roads will impact on dust fallout (nuisance dust)	Air quality
2015	All	Vehicle entrainment on paved roads will impact on dust fallout (nuisance dust)	Air quality
2015	Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on Respirable dust (PM10)	Air quality
2015	Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on Respirable dust (PM10)	Air quality
2015	All	Infrastructure removal will impact on Respirable dust (PM10)	Air quality

Year	Activity	Potential Impact	Aspects affected
2015	All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	Air quality
2015	All	Demolition of infrastructure – blasting will impact on Gaseous emissions	Air quality
2015	All	Tailpipe emissions from vehicles will impact on Gaseous emissions	Air quality
2015	All	Increase in noise levels as a result of demolition of infrastructure	Noise and Vibration
2015	All	No additional impacts expected	Sensitive landscapes
2015	All	No additional impacts expected	Visual aspects
2015	All	No additional impacts expected	Archaeological and cultural interest
2015	All	Cessation of employment	Socio-Economic structure
2015	All	Reduced economic activity	Socio-Economic structure
2015	All	Potential re-employment of employees	Socio-Economic structure
2015	All	Changed land-use after rehabilitation	Land use

10. METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

10.1. Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) and as amended from time to time (DEAT, Impact Significance, Integrated Environmental Management, Information series 5., 2002).

The level of detail as depicted in the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) (DEAT, Impact Significance, Integrated Environmental Management, Information series 5., 2002)) was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

An explanation of the impact assessment criteria is defined below.

Table 10-1: Impact Assessment Criteria

EXTENT	
Classification of the physical and spatial scale of the impact	
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site	The impact could affect the whole, or a significant portion of the site.
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
National	The impact could have an effect that expands throughout the country (South Africa).
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
DURATION	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
Short to Medium term	The impact will be relevant through to the end of a construction phase (1.5 years).
Medium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long term	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
INTENSITY	

EXTENT	
Classification of the physical and spatial scale of the impact	
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
PROBABILITY	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

The status of the impacts and degree of confidence with respect to the assessment of the significance must be stated as follows:

- **Status of the impact:** A description as to whether the impact would be positive (a benefit), negative (a cost), or neutral.
- **Degree of confidence in predictions:** The degree of confidence in the predictions, based on the availability of information and specialist knowledge.

Other aspects to take into consideration in the specialist studies are:

- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the full-lifecycle of the proposed development, including construction, operation and decommissioning.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region.
- The specialist studies must attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

10.1.1. Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

10.1.1.1. Determination of Significance-Without Mitigation

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

Table 10-2: Significance-Without Mitigation

NO SIGNIFICANCE	The impact is not substantial and does not require any mitigation action.
LOW	The impact is of little importance, but may require limited mitigation.
MEDIUM	The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
HIGH	The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

10.1.1.2. Determination of Significance-With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

Table 10-3: Significance-With Mitigation

NO SIGNIFICANCE	The impact will be mitigated to the point where it is regarded as insubstantial.
LOW	The impact will be mitigated to the point where it is of limited importance.
LOW TO MEDIUM	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.
MEDIUM	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
MEDIUM TO HIGH	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
HIGH	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

10.1.2. Assessment Weighting

Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it was necessary to weigh and rank all the criteria.

10.1.2.1. Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer Table 10-4). The purpose of assigning weights serves to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

Table 10-4: Description of assessment parameters with its respective weighting

EXTENT		DURATION		INTENSITY		PROBABILITY		WEIGHTING FACTOR (WF)		SIGNIFICANCE RATING (SR)	
Footprint	1	Short term	1	Low	1	Improbable	1	Low	1	Low	0-19
Site	2	Short to Medium	2			Possible	2	Low to Medium	2	Low to Medium	20-39
Regional	3	Medium term	3	Medium	3	Likely	3	Medium	3	Medium	40-59
National	4	Long term	4			Highly Likely	4	Medium to High	4	Medium to High	60-79
International	5	Permanent	5	High	5	Definite / Uncertain	5	High	5	High	80-100
MITIGATION EFFICIENCY (ME)						**SIGNIFICANCE FOLLOWING MITIGATION (SFM)**					
High			0.2			Low				0 - 19	
Medium to High			0.4			Low to Medium				20 - 39	
Medium			0.6			Medium				40 - 59	
Low to Medium			0.8			Medium to High				60 - 79	
Low			1.0			High				80 - 100	

10.1.2.2. Identifying the Potential Impacts Without Mitigation Measures (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

10.1.2.3. Identifying the Potential Impacts with Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact.

(ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation efficiency (ME) rating (refer to *Table 10-4*). The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2:

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency

or WM = WOM x ME

10.1.2.4. Significance Following Mitigation (SFM)

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

11. THE POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY (IN TERMS OF THE INITIAL SITE LAYOUT) AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

The proposed alternatives are outlined in Section 6.1 and the discussion around the preferred sites for the TSF is indicated in Section 6.1.1.2. From these sections the following is noted with regards to advantages and disadvantages relating to the new tailings storage facility options investigated. Both TWF1 and TWF3 sites were evaluated by the specialists and a summary of impacts are provided in Table 11-1.

Table 11-1: Advantages and disadvantages of the two TSF location options

Advantages	Disadvantages
TWF1 option	
The site is located outside the 1 in 50 year flood and more than 100 m from the perennial Dwars River.	In terms of the natural environment this site is in a more natural condition than the preferred site (TWF3 and old pit) and provides good habitat for fauna. In addition three sites of archaeological concern was recorded in this area and should the TSF be constructed here this will result in destruction of this habitat and potential arc geological artefacts. This site is also more visible from the provincial road compared to TSF3 and the old pit.
TWF3 and old pit – Preferred option	
The site is severely disturbed by historical mining activities and will result in less environmental impacts in terms of fauna, flora, and soil. With the proposed treatment of the tailings to make it a Type 4 waste this will reduce the potential impact from depositing tailings here. This site is not located next to the provincial road and will be less visible.	The unnamed tributary of the Dwars River that is already diverted around the historic pit, will need to be diverted more to allow for a tailings facility across the historic open pit once backfilled. However, mitigation measures can be put in place to reduce erosion of the diverted water course and to capture siltation.

With regards to the proposed WRD expansion, no alternatives are investigated as the area for the expansion is located next to the existing WRD and will be located on a brownfield area. Thus no greenfields area will be disturbed.

It should be noted that Tweefontein Section is an operational mine and the existing site layout was planned in accordance with the most suitable layout to ensure that the mineral resource is mined in a responsible manner. All new infrastructure is planned around the existing infrastructure and the mineral resource to allow for the least impact on the environment and the neighbours.

12. THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF 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).

Issues and concerns raised by the I&APs relating to the environment are outlined in Table 7-1, in addition to a brief discussion on the mitigation required / need thereof to address the concerns raised.

13. THE OUTCOME OF THE SITE SELECTION MATRIX. FINAL SITE LAYOUT PLAN

(Provide a final site layout plan as informed by the process of consultation with interested and affected parties)

Please refer to Section 6.1. Tweefontein Section is an operational mine and the mineral resource and the current infrastructures (Section 8.3.2) as well as the historical mining activities are taken into consideration for all phased activities undertaken by the mine. Taking this in the recommendations of the specialist into consideration the preferred site for the new TSF and the expansion of the WRD was determined as TWF3 and the historic opencast pit. The final site layout plan is provided in Appendix 4.

14. MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

As an operational mine any new infrastructure at Tweefontein is planned in accordance with the location of the existing activities and infrastructures as well as historically impacted areas. Though no alternative sites were evaluated for the WRD dump the proposed footprint is a direct extension of the current footprint and located on a browns fields area. With regards to the new tailings storage facility various options were investigated and the preferred option is TWF3 and the historic pit.

15. STATEMENT MOTIVATING THE PREFERRED SITE

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

As an operational mine any new infrastructure at Tweefontein Section is planned in accordance with the location of the mineral ore being exploited, existing activities and infrastructures as well as historically impacted areas. Taking the recommendations of the specialists into consideration (Section 6.1.1.2), advantages and disadvantages (Section 11) as well as the proposal to treat tailings to a Type 4 waste TWF3 and the historic pit is the preferred option for the new tailings disposal facility.

16. FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

(Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (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.)

The existing activities were assessed historically as part of the various EMPr amendments as submitted to the DMR. This information was consolidated into Table 9-1. The proposed new activities (TSF and WRD expansion) were assessed by each of the specialist as appointed for their respective fields and cumulative impacts were also assessed using the methodology as outlined in Section 10. Below is a summary of the methodology used by the respective specialist in their modelling and general assessments. For the results if the assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation please refer to Table 9-1 and Table 17-1.

16.1. Air Quality

16.1.1. Methodology used

To determine the extent of the potential impacts of the new TSF and WRD expansion the monitoring data as available from Samancor was used in a dispersion model. Emission factors were quantified using the Australian National Pollutant Inventory (NPI) for fugitive dust deriving from material handling, on-site roads, milling and crushing operations, drilling and blasting, and wind erosion from exposed surfaces. The regulatory model of the US.EPA, AERMET/AERMOD dispersion model suite, was chosen for the study as it uses both surface and upper air data and the model has a terrain pre-processor (AERMAP) for including a large topography into the model. A radius of 10 km was used in the model and impacts for unmitigated and mitigate activities were undertaken. Detail on the dispersion model parameters are outlined in Section 8 of the 2020 Air Quality Impact Assessment Report (EcoElementum Environmental and Engineering, 2020).

16.1.2. Description of environmental issues and risks

16.1.2.1. Modelling results - 2020

The results of the modelling for impacts on air quality, specifically PM10 and Total Suspended Particulate (TSP) is provided in Figure 16-1, Figure 16-2, Figure 16-3 and Figure 16-4 for unmitigated and mitigated scenarios. From the figures the following conclusions are drawn:

- When unmitigated an increase of PM10 levels of 10 – 20 ug/m^3 are predicted to occur and this is significantly reduced in extend and intensity when mitigation measures are implemented; and
- The predicted annual TSP deposition (unmitigated) is predicted to increase to 50 – 200 mg/m^2/day on the western side of the provincial road 200-300 mg/m^2/day directly on the TWF3 and immediate area and are thus is not expected to reach the provincial road. When mitigated the impact is significantly reduced and the model did not predict an increase in the annual TSP deposition.

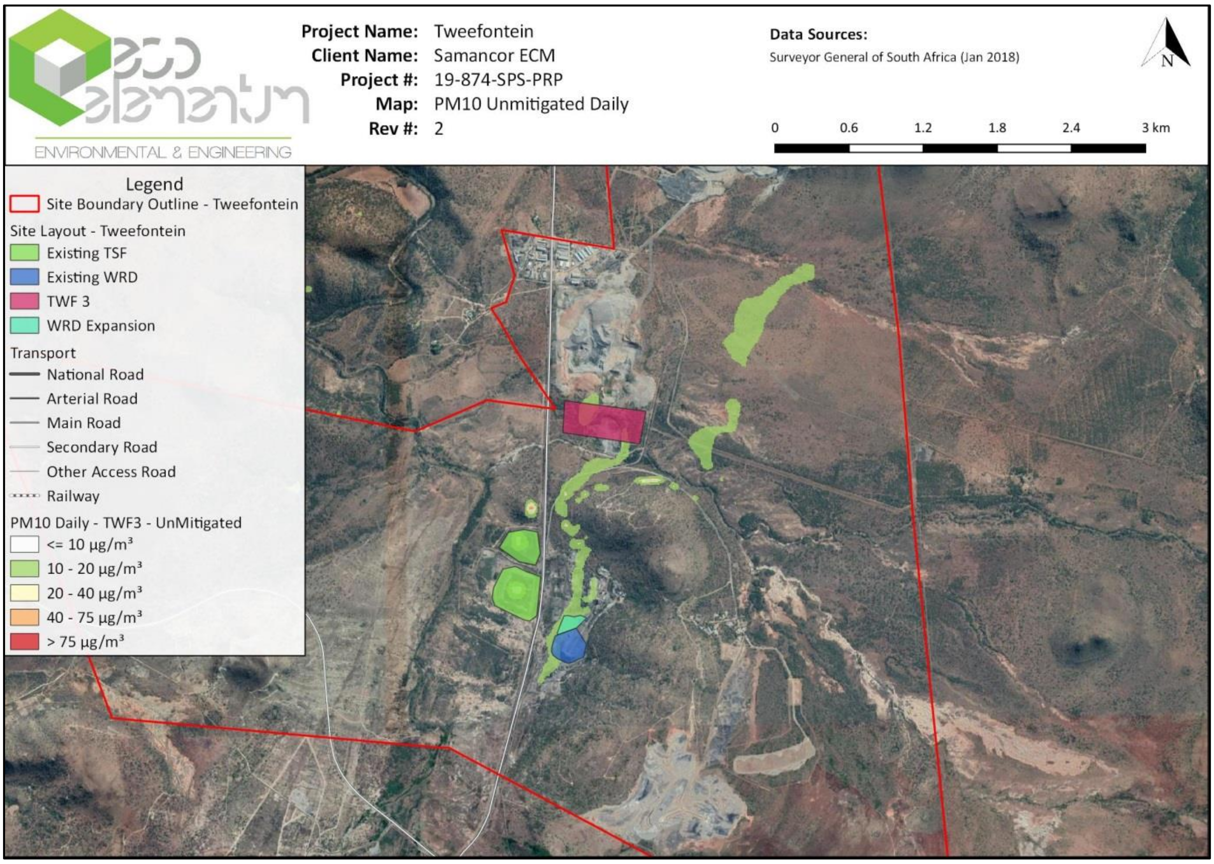


Figure 16-1: Predicted 2nd highest PM10 concentration for Tweefontein TWF3 option (unmitigated)

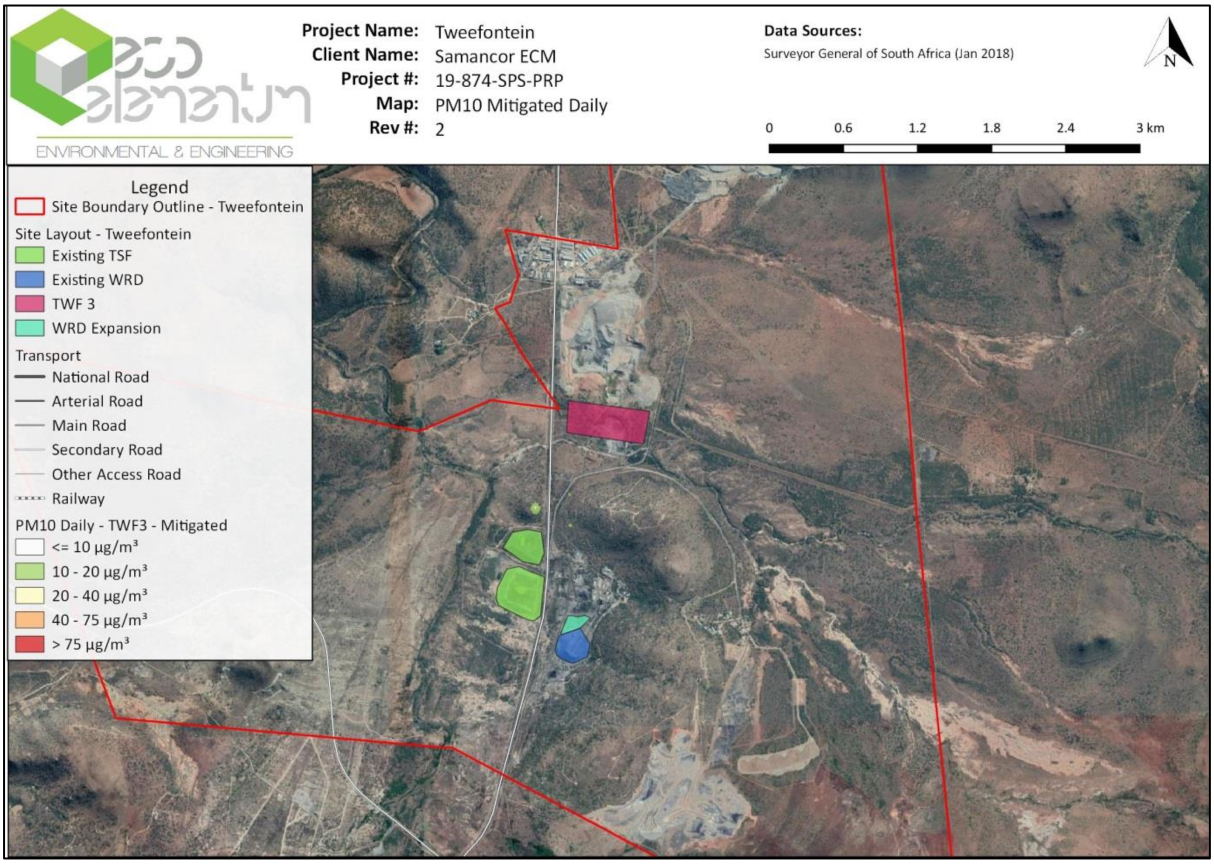


Figure 16-2: Predicted 2nd highest PM10 concentration for Tweefontein TWF3 option (mitigated)

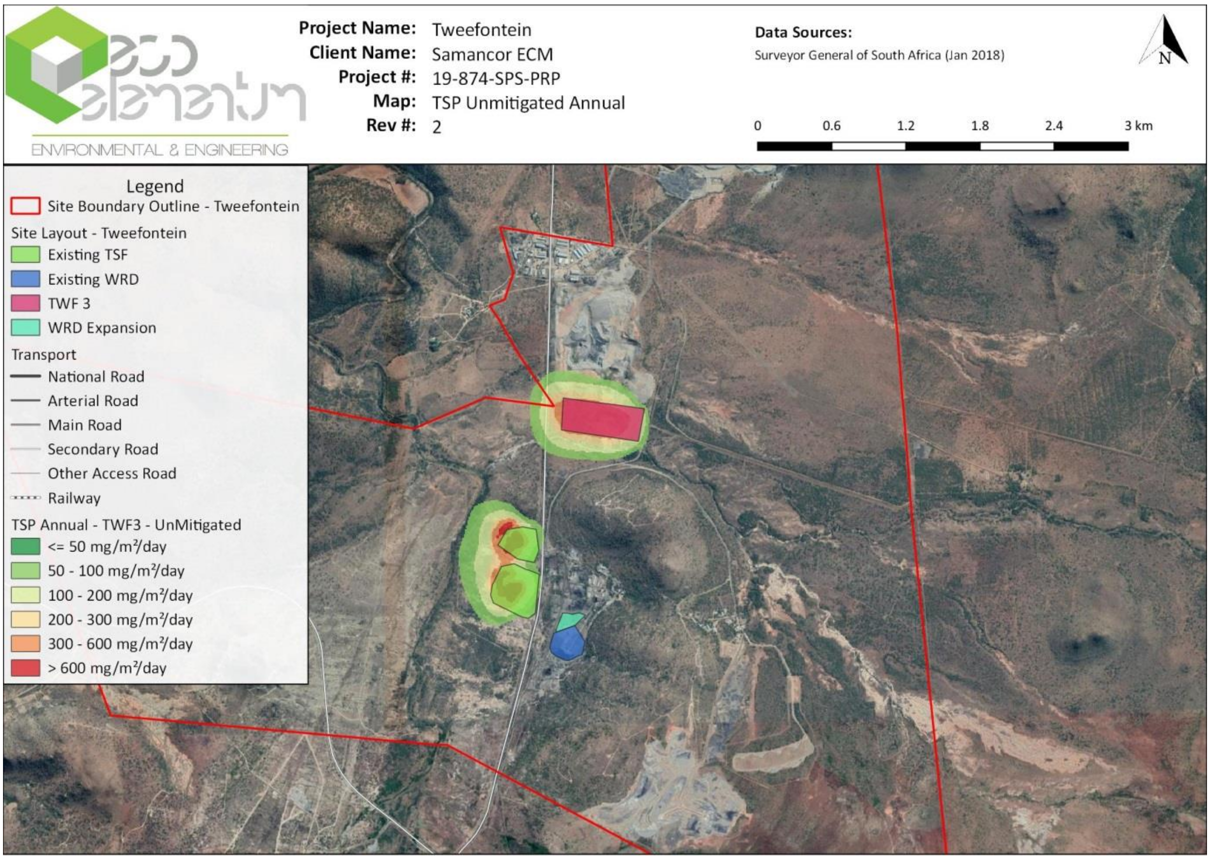


Figure 16-3: Predicted average annual deposition for TSP for TWF3 option (unmitigated)

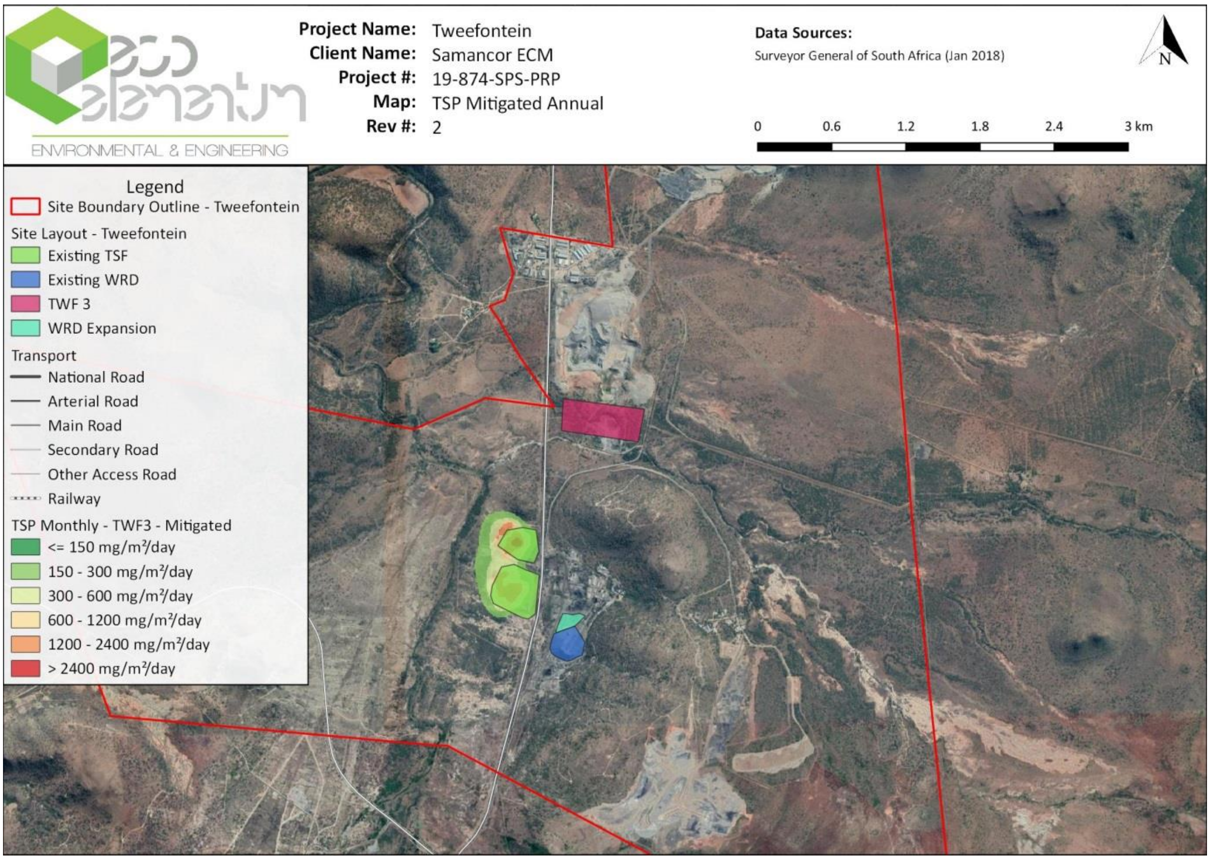


Figure 16-4: Predicted average annual deposition for TSF for TWF3 option (mitigated)

16.1.2.2. General description of impacts and risk identified

Potential impacts that could occur as a result of construction, operation and closure / decommissioning phases for the new TSF as well as the WRD expansion were assessed and descriptions are provided below:

- During the construction phase site clearing inclusive of removal of topsoil and vegetation will take place and this will result in dust generation. Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts such as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)). It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. In addition, the entrainment from the vehicle itself or dust blown from the back of the bin of the trucks during transportation of material to and from stockpiles will also generate dust. This activity will be short-term and localised, seizing after construction activities.
- Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, drilling, drilling blasting, etc.) all will have an impact on the ambient air quality as it will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).
- During construction, the general transportation, hauling and vehicle movement on site will result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations and if uncontrolled, they can be a safety hazard by impairing the operator’s visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air.
- During the operational phase of the new TSF and WRD expansion modelling indicated that the mitigated and unmitigated 1) daily PM10 concentrations did not exceed the 75 µg/m^3 limit for any of the sensitive receptors and 2) the annual PM10 limit of 40 µg/m^3 are predicted not to be exceed at any of the identified sensitive receptors.
- During the operational phase modelling indicated that the for both mitigated and unmitigated scenarios no sensitive receptors will be exposed to the highest residential monthly limit of 600 mg/m^2/day and the annual dust fallout are not predicted to exceed the annual limit of 300 mg/m^2/day.
- During the decommissioning and closure phase the demolition and removal of all infrastructures (inclusive of the transportation off site) the impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase as these activities will cause fugitive dust emissions. The impacts will be short-term and localised and will seize once the activities are finalised.
- During the decommissioning and closure phase rehabilitation activities inclusive of spreading of soil, re-vegetation, profiling and contouring will take place. Top soiling generally result in less transfer of soil from one area to the next thus the chances of dust generation through wind erosion is negligible. The profiling of the dumps and waste rock dump to enhance vegetation cover and reduce wind erosion will also reduce fugitive dust generation.
- Cumulative impacts: Tweefontein mine is not the only mine in the area that generates fugitive dust and particulate emissions and thus three levels of cumulative impacts were considered:
    - Project site localised cumulative impacts: These are the cumulative impacts that result from mining operations in the immediate vicinity of the project site and includes the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers. These include mainly dust deposition. From this air impact assessment conducted for the proposed project the modelling indicates the cumulative pollution plume emanating from this site as a combination of activities and shows that the impacts will be mainly localised around and in the vicinity of the operations.

- Regional cumulative impacts: Regional cumulative impacts include the project's contribution to impacts that are caused by mining operations throughout the region and though each mining operation in itself may not represent a substantial impact, the cumulative effect on air quality in the region may warrant consideration. The mining sector in South Africa is growing steadily and therefore this project will also contribute to the larger regional impact that will be experienced.
- Global cumulative impacts: The only impact from the project that is potentially global is the generation of potential greenhouse gas emissions. However, the level of emissions from the project represents a very minor and insignificant contribution at this scale.

From the previously approved EMPr and its approved addendums the following impacts were identified:

- Mining operations within opencast pits (inclusive of drilling and blasting), Material handling operations, Vehicle entrainment on paved roads, continuous rehabilitation activities, wind erosion from residue deposits and stockpiles (Tailings, topsoil, ROM, Overburden and Waste Rock) will impact on dust fallout (nuisance dust) and respirable dust (PM10).
- Blasting of overburden and underground reef will impact on the gaseous emission as will the release of exhaust emissions from vehicles on paved and unpaved roads and the operation of diesel machinery underground.
- No predictive modelling was conducted.

The 2020 report drafted by EcoElementum Environmental and Engineering identified potential risks to climate change as discussed below:

- The mining sector is extremely energy intensive and a major emitter of greenhouse gasses and the total CO_2 emissions vary across the industry and largely depends on the type of resource mined as well as the design and nature of the mining process. Generally speaking, the available mining deposits are occurring at increasingly deeper areas and of a declining ore grade. As a result there is a growing demand for water (fooling purposes) as well as greater mine waste which result in increased energy consumption as well as the industry's climate footprint. At the same time, greater scrutiny of the industry's carbon emissions and the recent success in climate negotiations are increasing pressure on mining companies to explore ways to reduce their emissions, for example by using renewable energies.
- Mining is a sector that is particularly vulnerable to climate change as it will have both direct (operational and performance-based) and indirect (securing of supplies and rising energy costs) impacts. Increasingly a number of these impacts may cross-fertilise to potentially result in newer, more complex arrangements of second-order impacts. Underlining these risks is the fact that some of the world's largest mining operations currently operate in remote, climate sensitive regions. In addition to these risks, the associated reputational risks to the companies and their social licence to operate may be fatally permanent in nature. These risks and the absence of a concerted industry-wide approach to adaptation to climate change may threaten investor confidence and impact insurance dynamics over the long-term. However, such 'tipping points' can also trigger innovation and some of this innovation has begun to take place already, albeit mainly to reduce costs.
- The extractives sector plays an indispensable role in the economic development models and plans of many regions and countries. However, very little knowledge exists that draws out the connection between climate change and natural resource development within the context of developing countries, which are projected to experience greater vulnerability to climatic shifts. On the one hand, climate change carries the risk of further aggravating changes in natural environmental conditions which in turn, may disrupt resource-dependent livelihood generation, including herding, agriculture and fisheries. On the other hand, limited technical and financial resources already pose a challenge for current efforts to adapt to a changing climate. Therefore, it is important that the role of the extractives sector in a broader development context, including its complex interlinkages with a changing climate is better understood and incorporated in policy and strategic decision making.

- Developing, newly industrialised and industrialised countries share climate risks faced by mining companies and countries that depend on the mining sector for their development. These countries are highly dependent on a secure and stable supply of resources and any risks or vulnerabilities that global supply chains may be exposed to, can potentially cause a suite of social, economic and geopolitical disruptions. Climate change will have a multiplier effect on supply chain risks by adding to the complexity and increasing or altering existing risks. Since a large and increasing number of extractive resources come from developing nations which already lack resources for climate adaptation, there is an increasing need to undertake robust measures to ensure that supply chains are climate-resilient.

16.1.3. Significance assessment

Please refer to Table 9-1 and Table 17-1.

16.2. Terrestrial Ecology

16.2.1. Methodology

The following was undertaken as part of the terrestrial ecological impact assessment (Red Kite Environmental Solutions, 2020):

- Desktop assessment: to determine if there are any potentially sensitive species / receptors Aerial photography and satellite imagery was used to delineate potential sensitive habitats for the field assessment and the South African National Biodiversity Institute's (SANBI) online biodiversity tool as well as the Virtual Museum and Animal Demography Unit (ADU) was used to query species lists for the 2430CC quarter degree grid cell and this information was supplemented by researching all available books and peer reviewed websites.
- Site verification: A site survey was conducted on 19 March 2020 to confirm and verify the desktop information. During the site investigation, the site was traversed on foot and fauna - (using the plotless sampling method) and flora species, inclusive of a scan for species of conservation concern (using the checklist of Germishuizen & Meyer, 2003 as cited by (Red Kite Environmental Solutions, 2020)) were recorded as encountered.
- Sensitivity assessment: potentially sensitive features were evaluated and ranked as No-go areas, High sensitivity, Medium sensitivity and low sensitivity (please refer to Section 8.3.1.3) taking the following into consideration:
  - The general status of the vegetation of the study area was derived by compiling a land cover data layer for the study area (Fairbanks et al. 2000 as cited by Red Kite Environmental Solution, 2020) using available satellite imagery and aerial photography into areas which are likely to be transformed versus those that are still in a natural status. This status stratification was then verified in the field using on-the-ground information on species composition and vegetation structure.
  - Various Provincial, Regional or National level conservation planning studies have been undertaken in the area, e.g. Limpopo Conservation Plan and the mapped results from these were taken into consideration in compiling the habitat sensitivity map.
  - Habitats in which various species occur that may be protected or are considered to have high conservation status are considered to be sensitive.

16.2.2. Description of environmental issues and risks

16.2.2.1. Modelling results

No modelling was applicable to the ecological assessment.

16.2.2.2. Other issues and risks

From the approved EMPr the following are applicable (please refer to Table 9-1):

- As a result of the mining, processing and other supporting infrastructures and activities there may be a loss of indigenous animals during the construction and operational phases.
- Construction and operational phases. The historical and current operations could have resulted in a loss of rare plant species and could have resulted in the growth of alien invasive plant species. The activities could also have resulted in a loss of species diversity and habitat characteristics.

For the 2020 expansion activities the following impacts were identified:

- Construction phase:
  - Most of the impacts on plant species will occur during the construction phase when removal of plant communities will take place on site and this will likely destroy habitats and lead to possible invasive and/or exotic species establishing in the area and edge-effects. Alien and Invasive species may compete with indigenous species, likely leading to the migration of sensitive species from the site to a more favourable habitat.
  - The onset of construction activities will result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles may result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat.
  - Construction activities could fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds. This is relevant since the current habitat have value as foraging grounds and corridors for movement between other natural areas.
  - Impacts on Species of Conservation Concern (SCC) associated with the area.
  - The expansion of the WRD is not expected to bring forth ecological impacts, since the area designated for development falls within the dirty /development footprint where the WRD already occurs.
- Operational phase:
  - This continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).
  - Invasive plant species may increase during the operational phase of the project. This will mostly take place in the remaining natural areas. Removal of these species is an ongoing process and if not managed regularly could result in severe changes and competition in plant communities.
  - Possible impacts on Species of Conservation Concern (SCC) if encountered by visitors and/or contractors.
  - Impacts to the wildlife during the operational phase of the TSF and WRD developments could occur, depending on alternative utilised.
- Decommissioning phase:
  - Decommissioning and rehabilitation will have similar impacts as the construction phase, but thereafter positive impacts as the natural environment starts to recover, restoring balance.

16.2.3. Significance assessment

Please refer to Table 9-1 and Table 17-1.

16.3. Noise

16.3.1. Methodology

As part of the 2020 noise assessment modelling was conducted (EARES, 2020). The noise emissions from various point sources were calculated in detail for the conceptual existing and operational activities by using the sound propagation algorithms described by the ISO 9613-2 model. While noise emission into the environment due to project road traffic (linear sources) was calculated using the sound propagation model described in RLS-90. Additional information is provided in Sections 8 and 9 of the report (EARES, 2020).

16.3.2. Description of environmental issues and risks

16.3.2.1. Modelling results

The construction phases for the TWF3 and waste rock dump was modelled and the results are provided in the figures below. As the deposition of tailings is a silent process using pipelines there will not be an impact on noise levels during the operational phase thus only construction phase was modelled. From the figures it can be seen that at night sound travels further than during the day and that it is still mostly localised close to the operational areas and the provincial roads. During night time some of the identified potential sensitive receptors may be exposed to increased noise levels of 35 – 45 dBa.

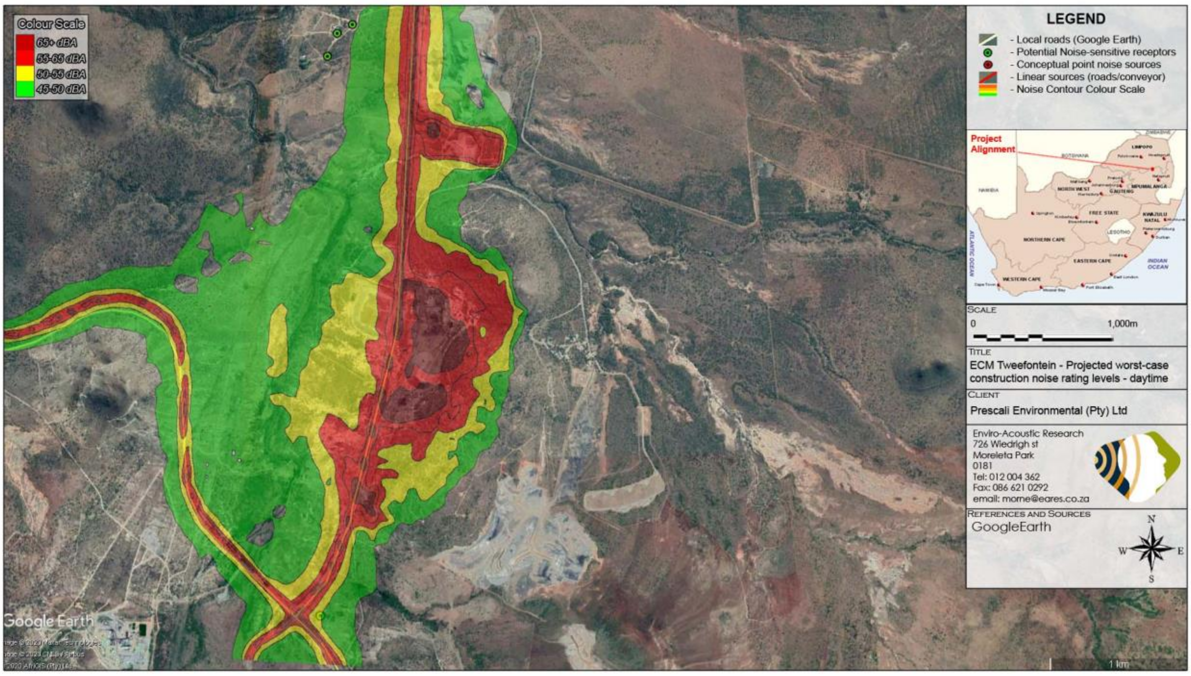


Figure 16-5: Projected conceptual future daytime noise rating levels for the construction in the TWF3 and pit area

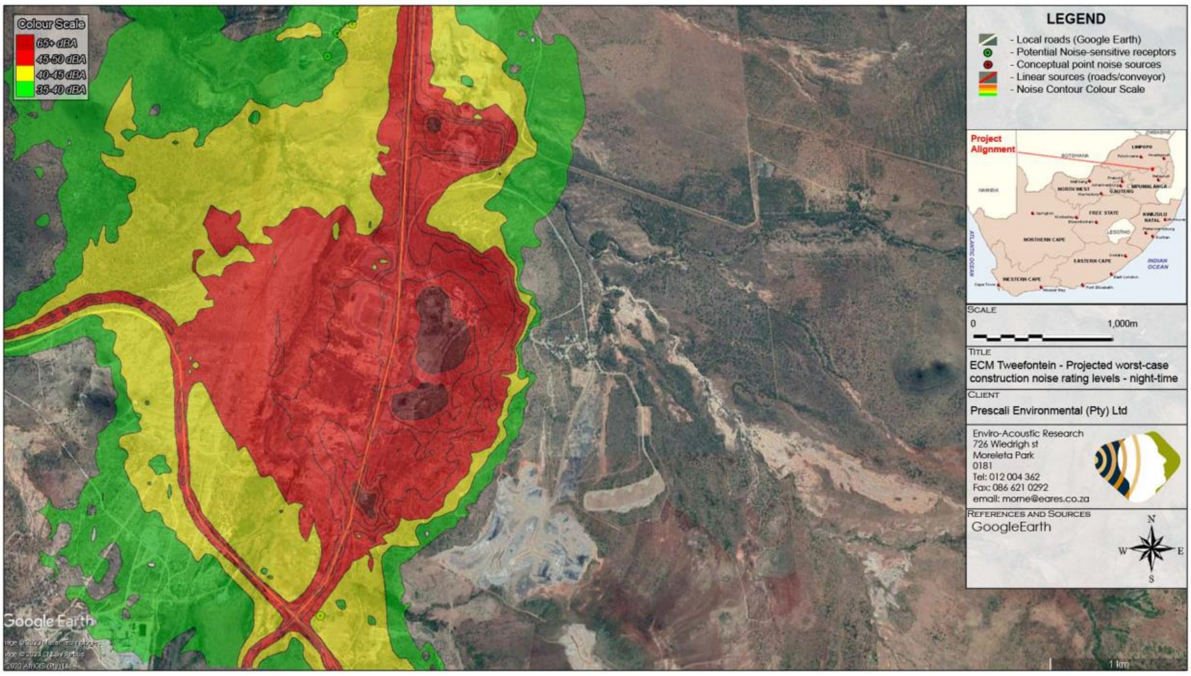


Figure 16-6: Projected conceptual future night time noise rating levels for the construction in the TWF3 and pit area

The potential change in noise rating levels as a result of the WRD expansion are defined in Table 16-1.

Table 16-1: Projected noise rating levels due to operation of WRD

NSD	Projected existing noise rating levels (dBA)		Projected noise rating levels with WRD (dBA)		Projected change in noise rating levels (dB)	
	Day	Night	Day	Night	Day	Night
1	43.8	37.3	43.8	37.3	0	0
2	42.5	37.0	42.5	37.0	0	0
3	42.1	37.1	42.1	37.1	0	0
4	50.3	42.5	50.3	42.5	0	0

The projected conceptual daytime operational noise levels are indicated in Figure 16-7. As can be seen noise is localised around the provincial roads and the current operational activities areas.

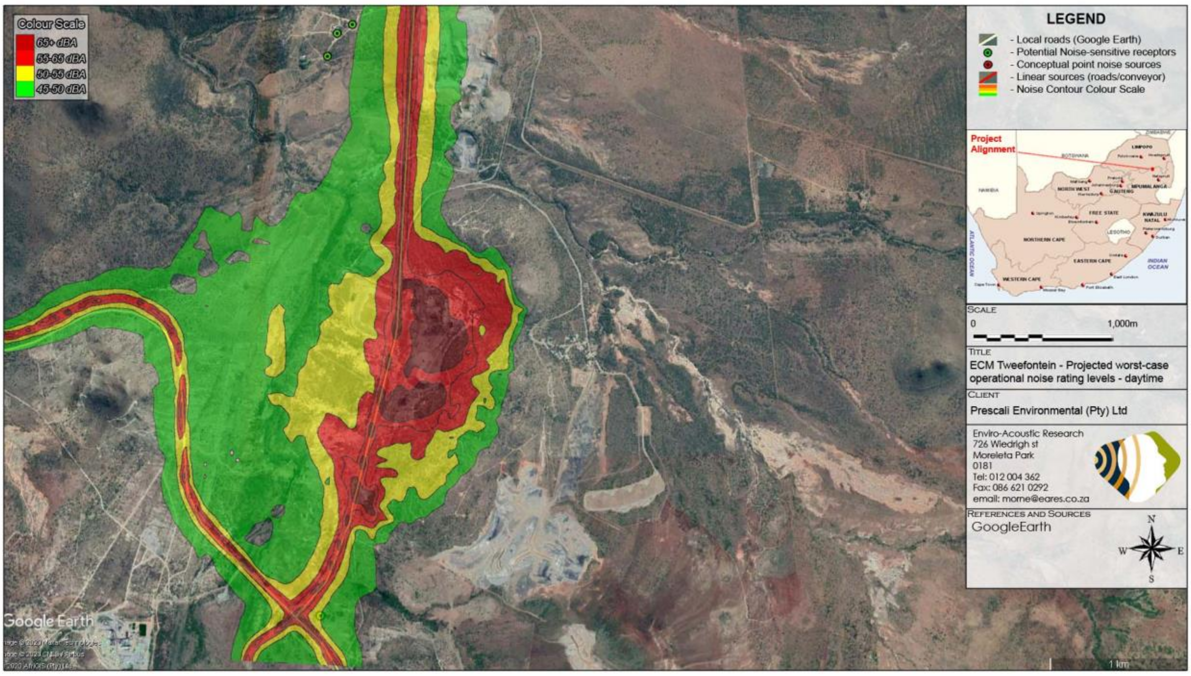


Figure 16-7: Projected future operational noise levels - daytime

16.3.2.2. Other

The proposed 2020 expansion activities will have low significant impact on the night time and daytime noise levels during all phases. With regards to the other activities as per the 2012 approved EMPr it is noted that the mining activities (e.g. opencast mining, processing, material handling etc.) and related activities could result in increased noise levels during the operational phase, during the closure phase there could be an increase in noise levels due to the demolition of infrastructure.

16.3.3. Significance assessment

The results if the noise impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1.

16.4. Visual

16.4.1. Methodology used

The full methodology used is outline in Sections 4 and 5 of the 2020 assessment conducted (EcoElementum Environmental and Engineering, 2020). Viewshed and viewing distances of up to 15 km from the proposed infrastructures were modelled using 1 km concentric radii zones. A visual exposure analyses was also conducted and included the following parameters: Terrain slop, aspects of structure location, landforms, slope position of structure, relative elevation of the structure, terrain ruggedness, visual absorption capacity (VAC[4]) and overall visual impact.

[4] The ability of elements of the landscape to “absorb” or mitigate the visibility of an element in the landscape. Visual absorption capacity is based on factors such as vegetation height (the greater the height of vegetation, the higher the absorption capacity), structures (the larger and higher the intervening structures, the higher the absorption capacity) and topographical variation (rolling topography presents opportunities to hide an element in the landscape and therefore increases the absorption capacity).

16.4.2. Description of issues and risks

16.4.2.1. Modelling results

Based on the modelling results conducted in 2020 the ruggedness[5] of the Tweefontein mining right area ranged from very rugged to smooth (Figure 16-8) and the area has a VAC ranging from Bad (10) to 2 (Figure 16-9). The Visual exposure ranking was modelled (Figure 16-10) and from the results it can be seen that Tweefontein ranked from very low to high. Overlaying the sensitive receptors with the visual exposure ranking (Figure 16-11) indicated that none of the identified sensitive receptor locations would be able to see the new expansion structures.

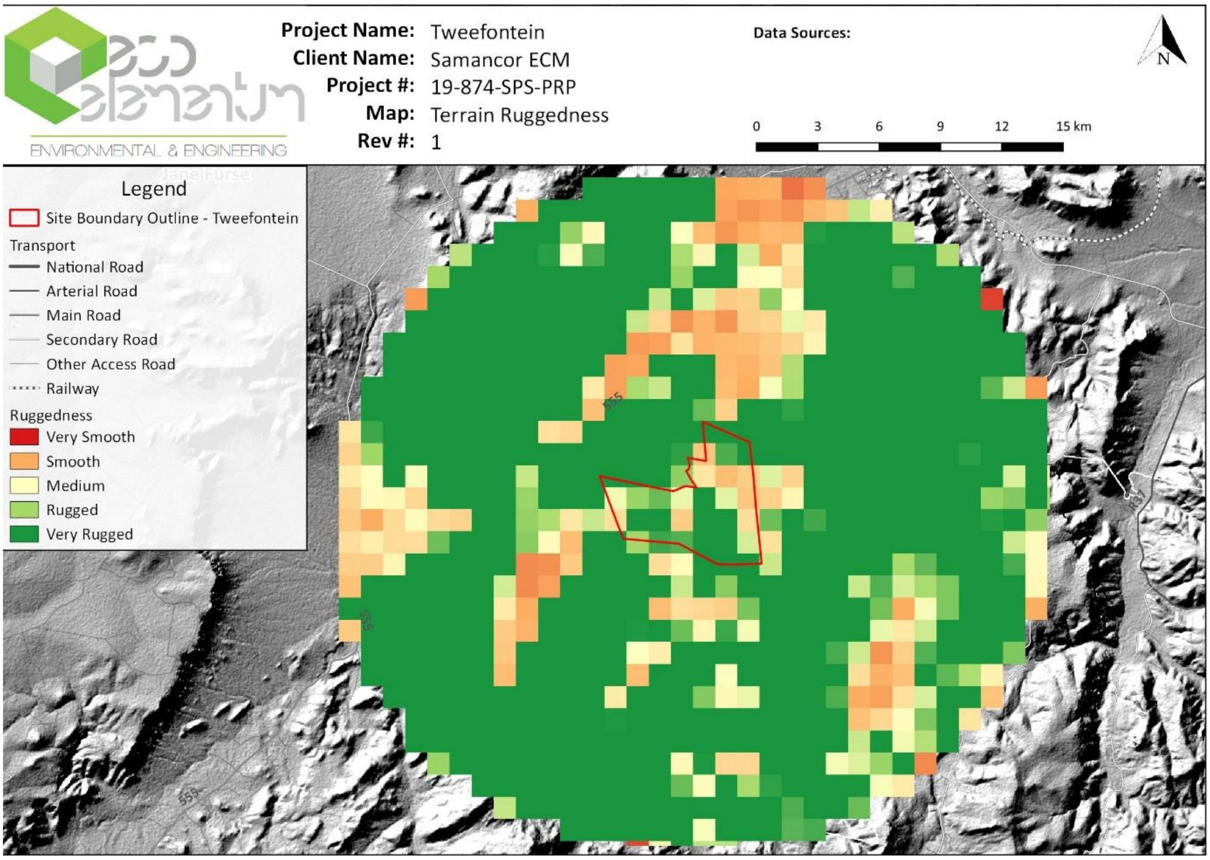


Figure 16-8: Terrain ruggedness

[5] Homogeneousness of the terrain

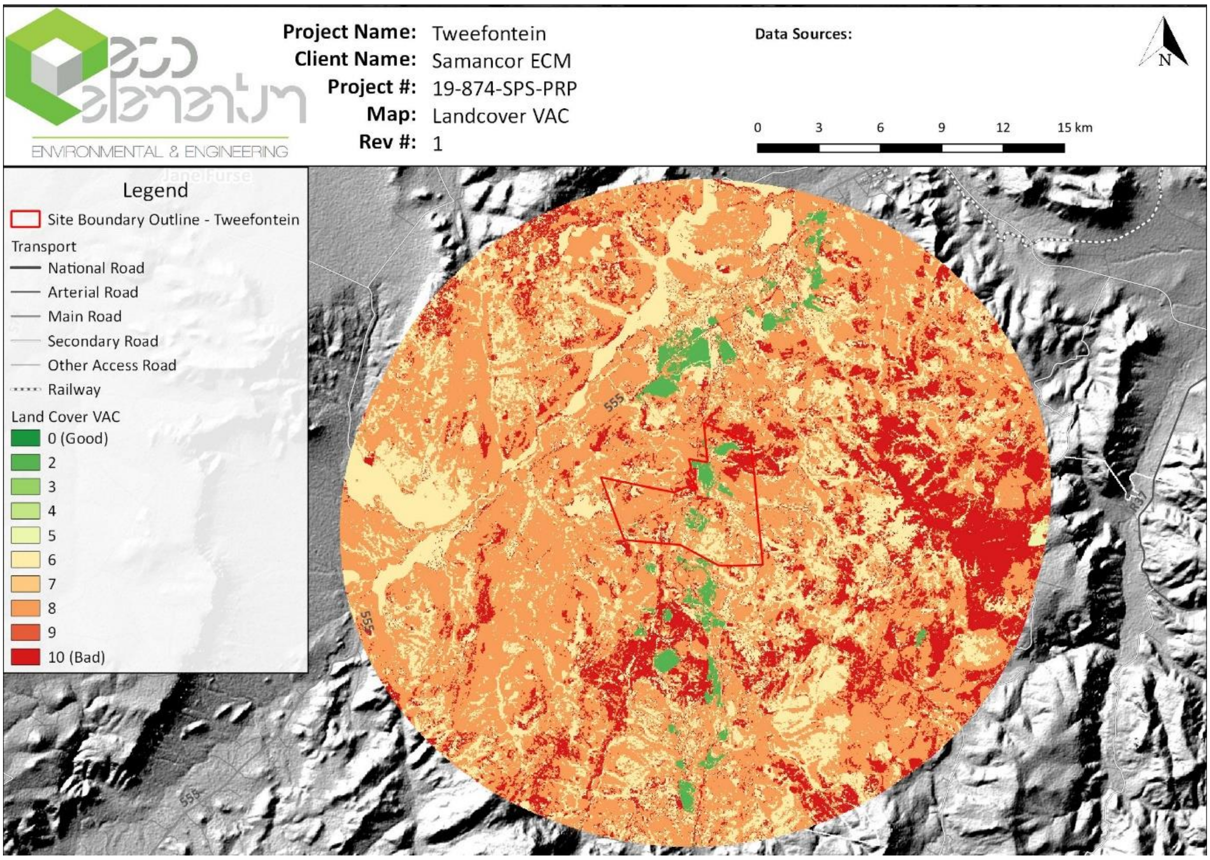


Figure 16-9: Possible VAC of the land cover

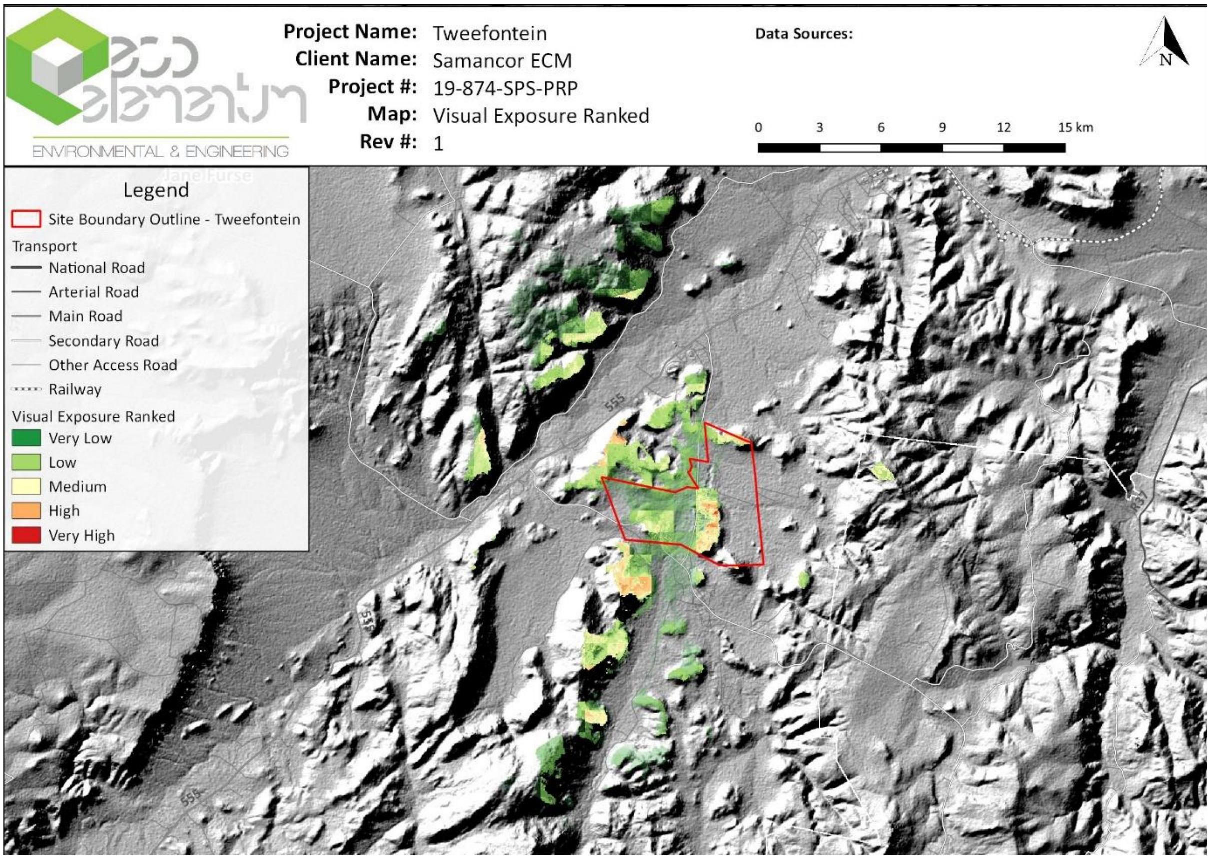


Figure 16-10: Visual exposure ranking

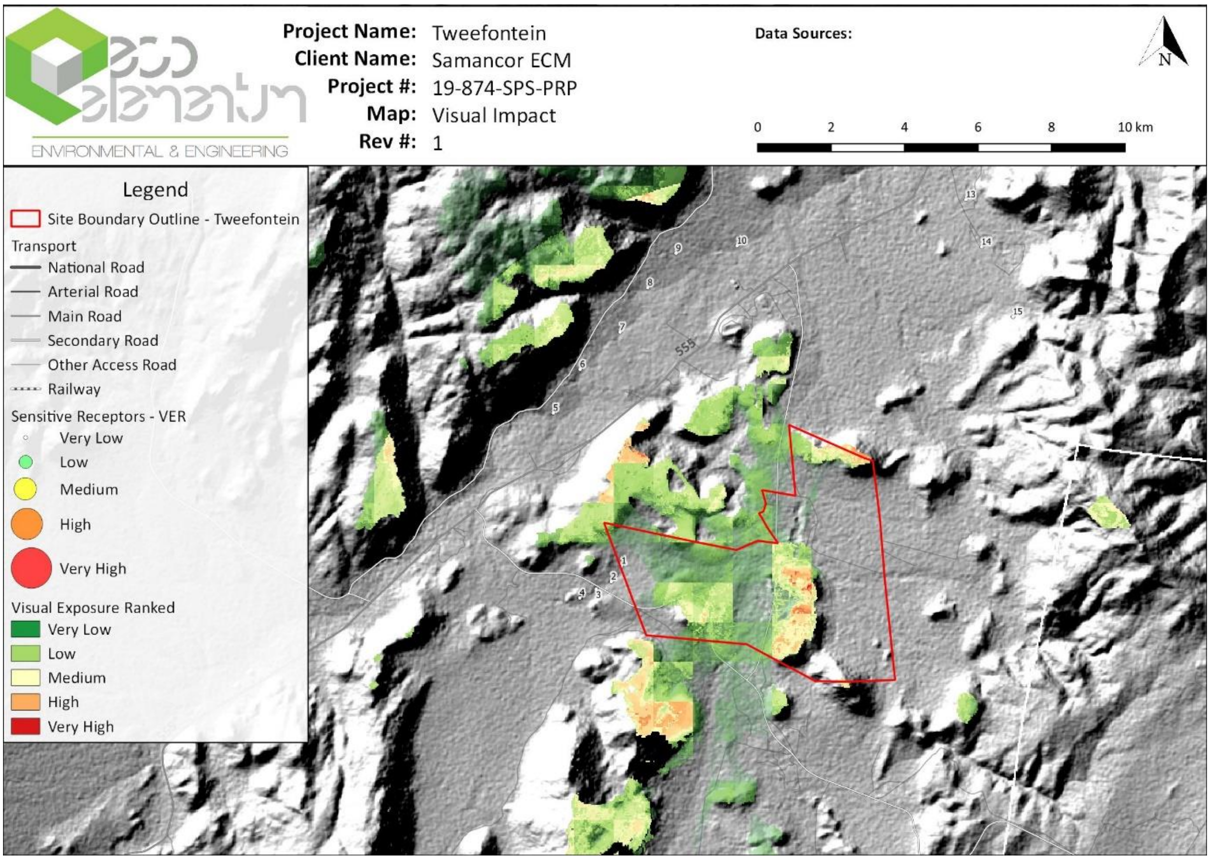


Figure 16-11: Viewpoint sensitive receptors overlaid with Visual exposure ranking – Visual impact

16.4.2.2. Other issues and risks

From the 2012 approved EMPr the following potential impact were noted:

- Visibility of the mining activities may impact on the sense of place, visual acuity during the construction and operational phases. It was also noted that due to Tweefontein's location in a valley surrounded by mountains and koppies, visibility of the mine in the local area is fairly poor.

From the 2020 assessment the significance rating was low as modelling indicated that none of the identified sensitive receptor locations would be able to see the new expansion structures.

16.4.3. Significance assessment

The results if the visual impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1 and Table 17-1.

16.5. Surface Water

16.5.1. Methodology used

The surface water assessment was conducted using available desktop information from various sources as indicated in Section 4 of the specialist report (Prescali Environmental Consultants, 2020). The desktop assessment was augmented by a site visit on the 11th of March 2020 (riparian assessment) and 15 July 2020.

A plotless sampling method was used and plant species observed in the riparian zone of the study area during the time of the study were recorded. The floristic composition of the riparian areas assessed are described and discussed. Plant species identification was done following the checklist of Germishuizen, G. & Clarke, B., (2003).

16.5.2. Description of issues and risks

16.5.2.1. Modelling results

No modelling is applicable.

16.5.2.2. Other issues and risks

The construction, operation and closure / post closure impacts from the 2020 expansion infrastructure are as follows:

- Vegetation removal and movement of vehicles during the construction phase within 100 m from a watercourse could result in increased levels of siltation to the more natural downstream area and result in hydrocarbon impacts.
- Diversion of the watercourse around the new TSF footprint area could result in siltation to the downstream area, impacts on the flow regime, habitat and biota as well as potential hydrocarbon impacts.
- The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure. During construction hydrocarbon spills from machinery may impact on surface water quality and the movement of materials may result in siltation. Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.
- During construction of the TSF and associated infrastructure impacts on water quality due to hydrocarbon spills and potential siltation due to the loosening of material may occur. The potential impacts on the surface water quality could impact on the habitat and biota of affected watercourses. The TSF and associated infrastructure will also impact on the flow regime of the watercourse as water will be removed from the system.
- Spills from the tailings and return water pipeline would result in impacts on the water quality (should the tributary be flowing at the time). If spills are not cleaned it could result in base flow water quality impacts. This in turn could impact on the habitat and the biota.
- No liner is possible in the pit thus it will not be possible to reduce leachate to the baseflow of the watercourse. This will have an impact on the baseflow water quality of the watercourse and have a negative impact on the water quality in the Dwars River. It is however proposed that the tailings be treated to type 4 before depositing to the old pit.
- During the closure phase of the TSF the movement of machinery may result in hydrocarbon spills. The increase in soil to act as a capping material may result in windblown dust and potential siltation that could impact on biota and the habitat. The vegetation of the TSF and associated infrastructure is a positive aspect. The potential of leachate generated by the TSF and associated infrastructure is still a possibility.
- Remining of the TSF could impact on water quality, habitat and biota should a spill occur. And should the liner system be compromised as a result of the re-mining this could impact on the surface water quality, habitat and biota.

From the 2012 approved EMPr the mining activities could impact on catchment yield (e.g. final void of opencast as well as all other mining activities) and surface water quality. The existing activities have already impacted on the watercourses and altered the flow in these.

16.5.3. Significance assessment

The results if the surface water impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1 and Table 17-1.

16.6. Heritage / Archaeological

16.6.1. Methodology used

The 2020 heritage assessment was done using a survey of available history, a field survey and oral history. The field survey was conducted using generally accepted archaeological and heritage impact assessment practises and aimed at locating all possible objects, sites and features of heritage importance (Pelser, A., 2020).

16.6.2. Description of issues and risks

16.6.2.1. Modelling results

No modelling is applicable.

16.6.2.2. Other issues and risks

No sites of historical importance were recorded at the proposed TSF site (TWF3 and old pit) and the WRD expansion. From the assessment done by (Pistorius, 2006) the construction and operation of mining activities at Klarinet could result in damage to the village from the recent past, damage to the graveyard may be damaged by mining operation and destruction of mining heritage remains.

16.6.3. Significance assessment

The results if the heritage impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1.

16.7. Soil, Agriculture and Land Use

16.7.1. Methodology used

For the 2020 soil and agricultural potential assessment a desktop assessment was conducted using available GIS information and a site inspection was conducted (ECO Soil, 2020). Land capability was determined following the guidelines in both Klingebiel and Montgomery (1961) (as cited by (ECO Soil, 2020).) and the Procedures For The Assessment And Minimum Criteria For Reporting On Identified Environmental Themes In Terms Of Sections 24(5)(A) And (H) And 44 Of The National Environmental Management Act, 1998. (P 30 Government Gazette, 20 March 2020). The investigation of the soils during the field trip involved the collation of the following soil information using the Taxonomic Soil Classification For South Africa (Soil Classification working group, 1991). A hand augur of the Thompson type, as well as observations at open cuttings was used for identifying the soil types. Additional information was obtained from the Land type information (Land Type Survey Staff. 1972 – 2006). More detailed information is provided in Section 6 of the specialist report (ECO Soil, 2020).).

16.7.2. Description of issues and risks

16.7.2.1. Modelling results

No modelling is applicable.

16.7.2.2. Other issues and risks

The proposed 2020 expansion activities could result in the following impacts:

- Disturbance of the soil resource as a result of all construction phase activities;
- Disturbance of soil, loss of soil due to erosion as well as contamination as a result of ineffective housekeeping and management of stockpiles and exposed soils during preparation and closure phases;
- A cumulative impact on disturbance of soil, loss and degradation of soils as a result of continued activities inclusive of mining and transportation during the preparation and operational phases;
- Increased or decreased sediment load to downstream systems as a result of continued activities inclusive of mining and transportation during the closure phase;
- Disturbance / loss / sterilization of the inherent land capability and land use as a result of stripping of soils, clearing of vegetation and stockpiling of materials during the preparation, construction and operational phases;
- Loss of land services, ecosystem support and services as a result of continuous clearing, disturbance, laydown, stockpiling and transportation during the preparation and post closure phases.

From the 2012 EMPr the following potential impacts are noted:

- Loss of topsoil during stripping, handling and placement on rehabilitated areas;
- Loss of topsoil fertility as a result of changes to the physical, chemical and biological soil properties which could affect the potential land use;
- Contamination of soils by fuels and lubricants from mining equipment;
- Change of land use from wilderness to mining and back to wilderness; and
- Impact on wilderness land used for mining activities.

16.7.3. Significance assessment

The results if the agriculture and land use impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1 and Table 17-1.

16.8. Geohydrological

Detailed information is available in the GPT report (Appendix 7).

16.8.1. Methodology used

The finite difference numerical model was used by GPT and it was created using AquaVeo's Groundwater Modelling System (GMS10) as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes, please refer to Section 7 of the GPT report for detailed information (GPT, 2020).

16.8.2. Description of issues and risks

16.8.2.1. Modelling results

As a result of dewatering, groundwater levels may decrease during the operational phase but <1 m. The groundwater drawdown at the level of boreholes will most likely affect the yield of boreholes in the areas coloured red and orange in Figure 16-12 and could affect boreholes in yellow and green areas. However, these impacted areas are mostly close to the mining areas and no known privately owned boreholes exist there. In the green areas further to the southwest, groundwater levels in boreholes could decrease by 5 metres or less, which is typical of seasonal variations and should thus not impact significantly on borehole yields.

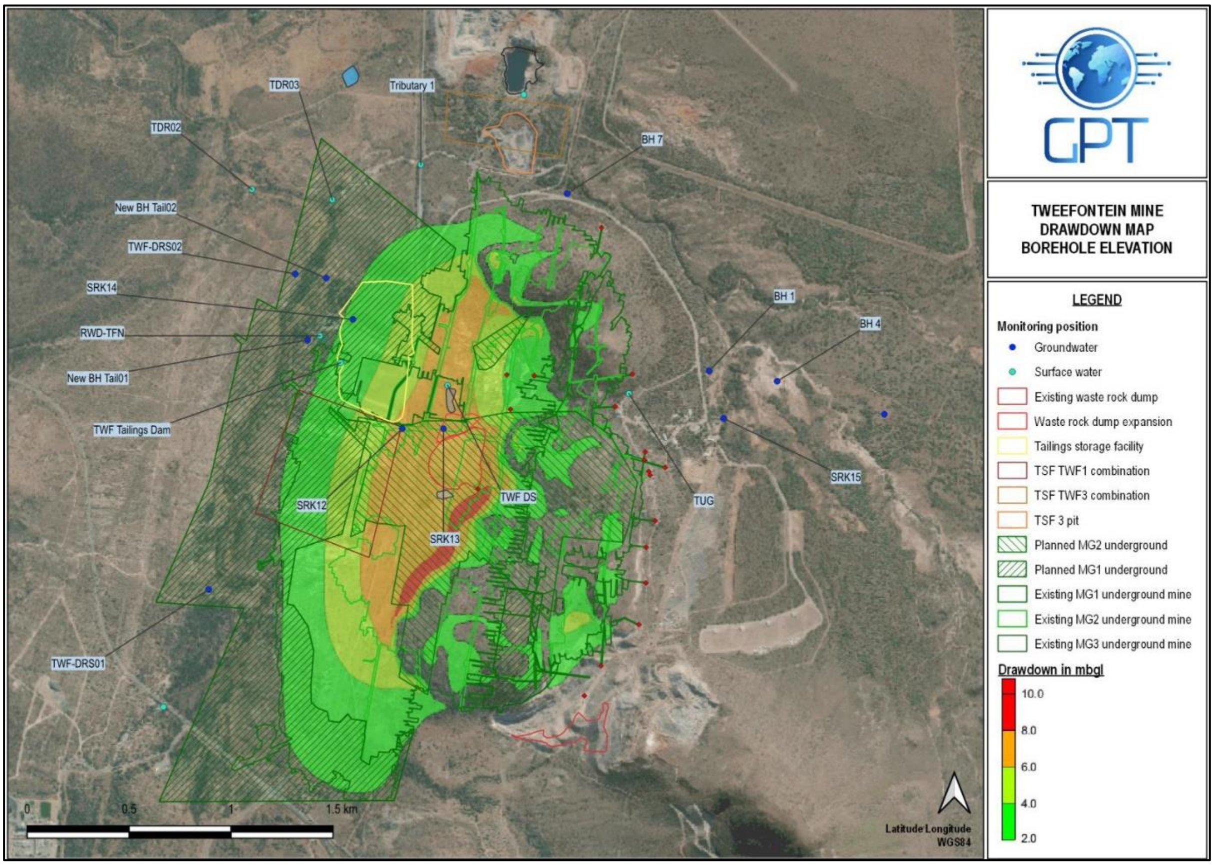


Figure 16-12: Cone of depression during mining (borehole elevation):

Post closure impacts on groundwater quality in the form of a pollution plume is expected, modelling indicated that groundwater can increase in sulphate concentration levels of between 100 – 500 mg/l. Refer to Figure 16-13 to Figure 16-16.

16.8.2.2. Other issues and risks

- During the operational phase flow in the aquifer will be directed to the mine thus little groundwater pollution is expected.
- During the decommissioning and post closure phase the mine will be allowed to flood and the groundwater regime will return to a state of equilibrium, this will take approximately 20 – 30 years.
- No decant is predicted.

16.8.3. Significance assessment

The results if the geohydrological impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1 and Table 17-1.

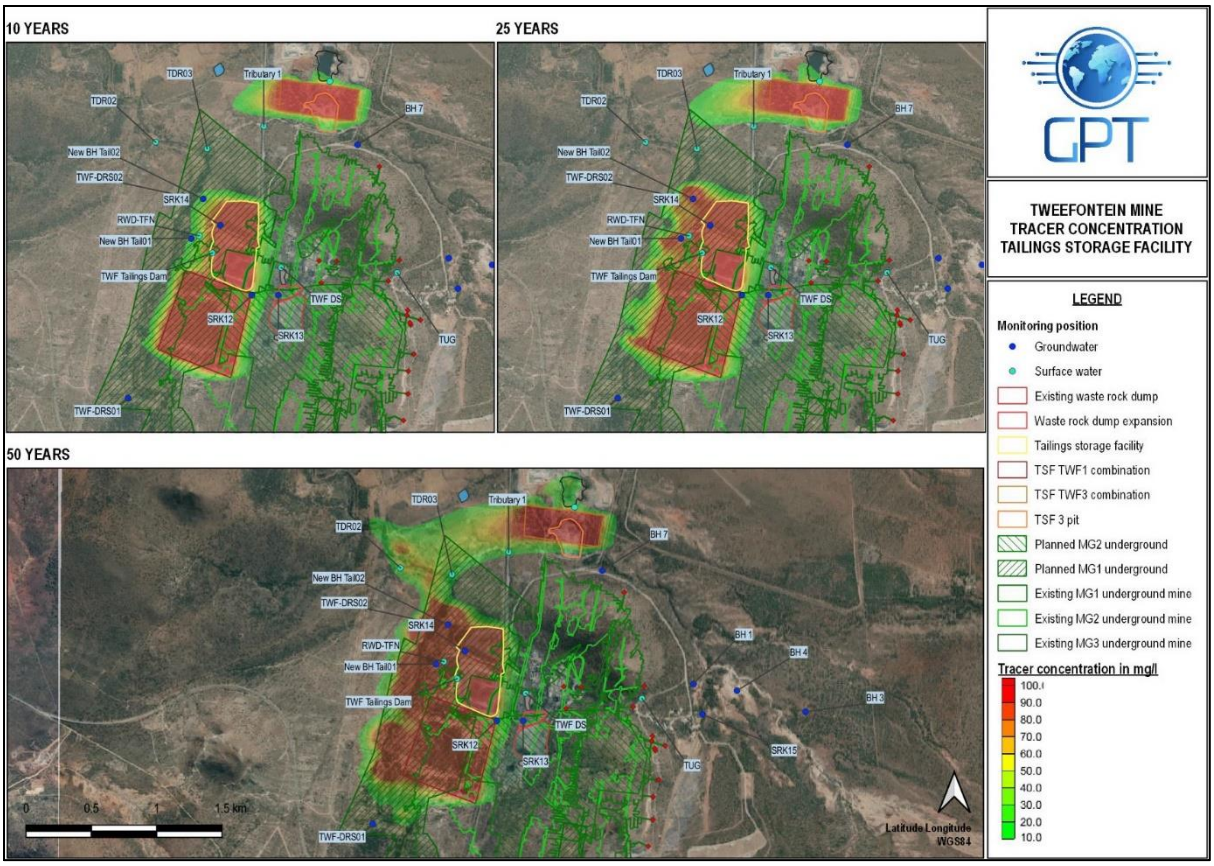


Figure 16-13: Predicted spread of pollution plume for TSFs existing and proposed

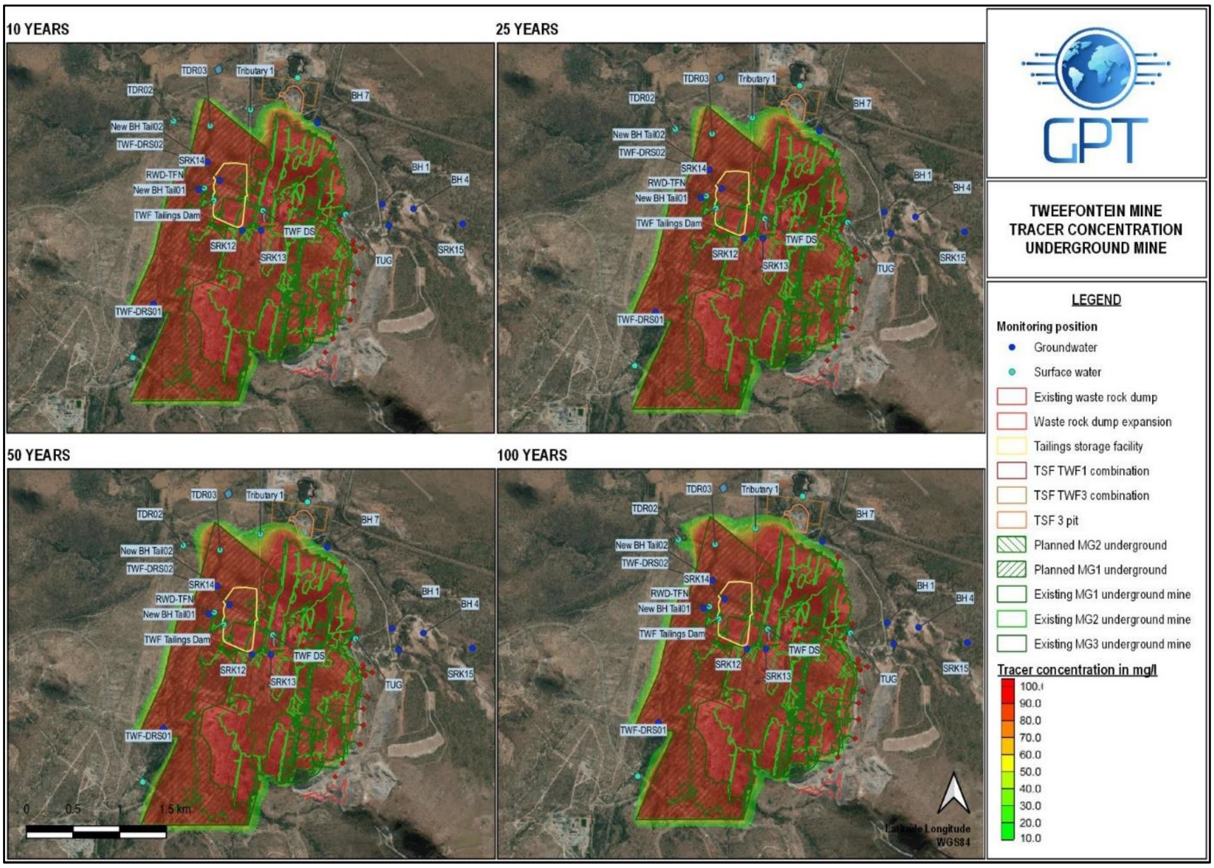


Figure 16-14: Predicted spread of pollution plume for underground activities

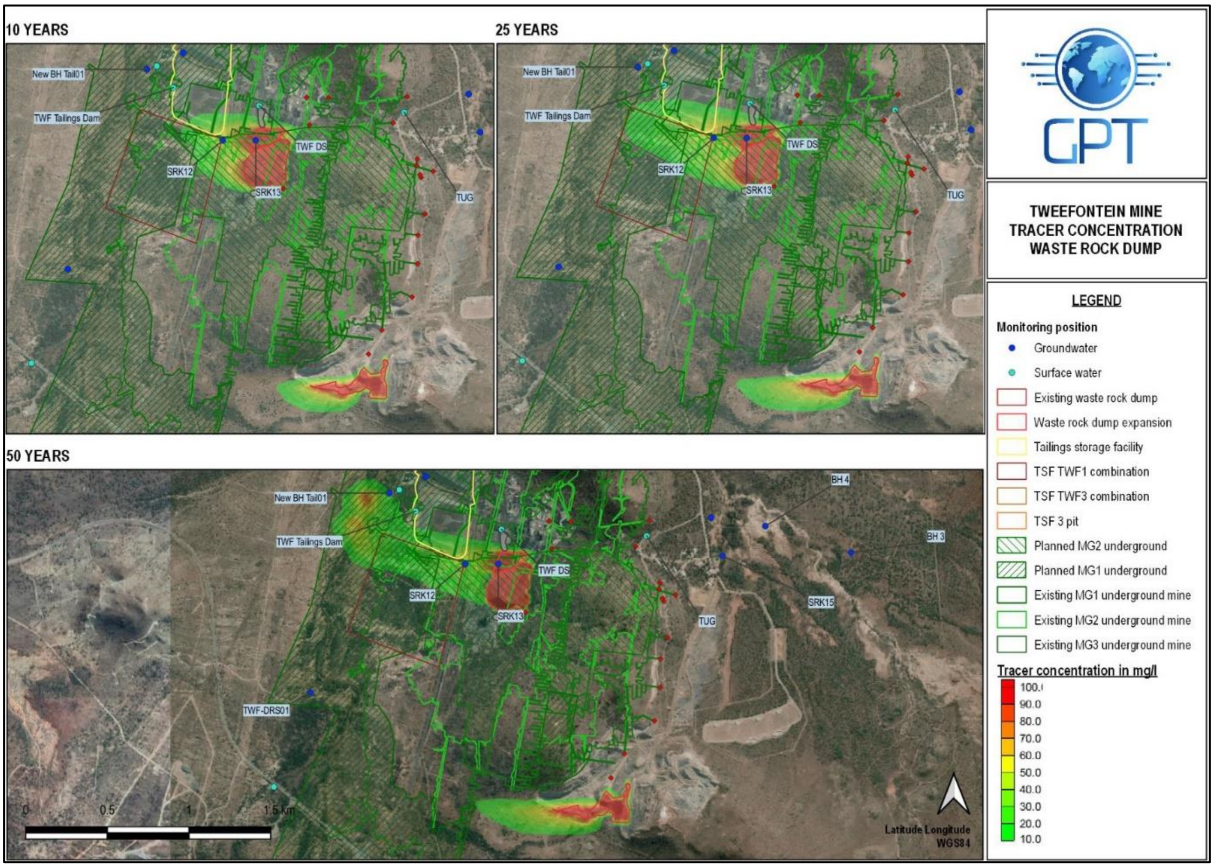


Figure 16-15: Predicted spread of pollution plume for WRD

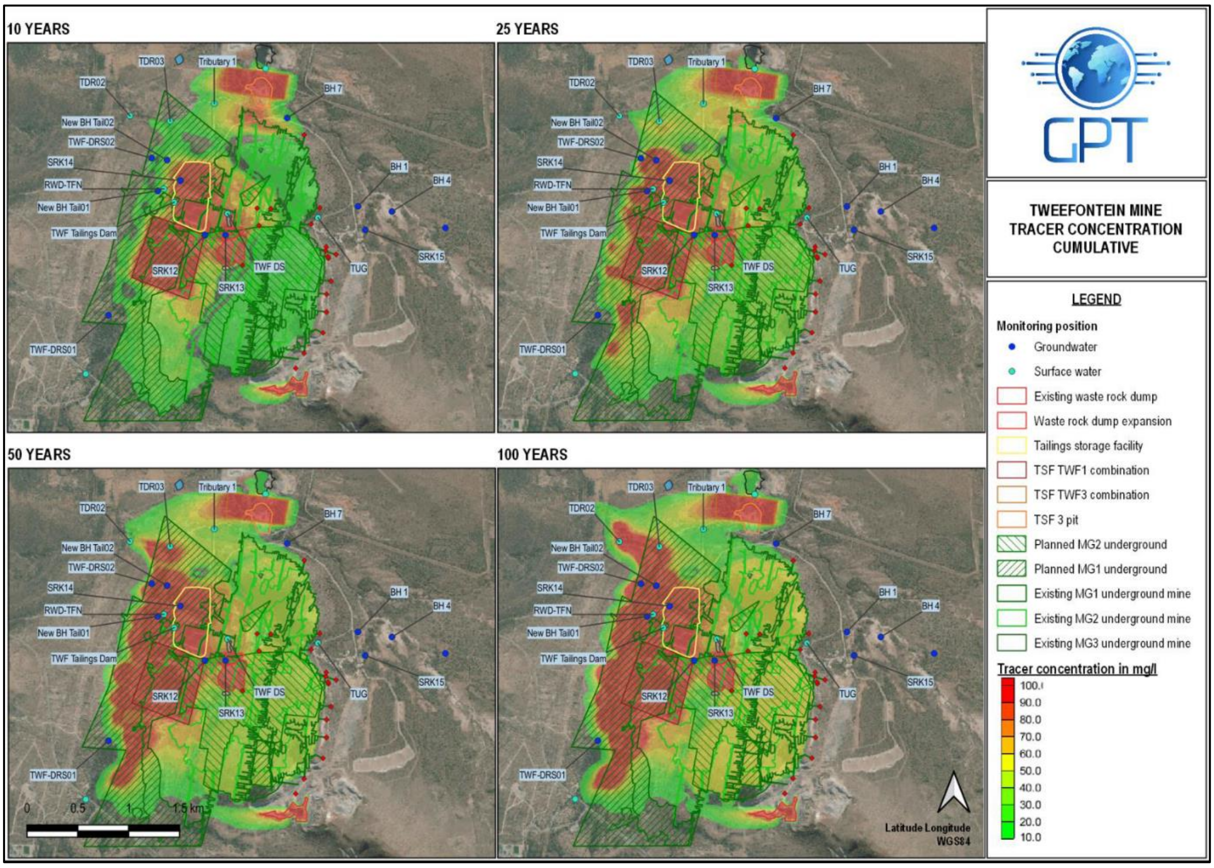


Figure 16-16: Predicted cumulative spread of pollution post closure

16.9. Socio Economic Assessment

16.9.1. Methodology used

A desktop regional socio-economic analysis was conducted based on regional socio-economic information. The regional information firstly elaborates on the legal and institutional framework, under which the SECM Tweefontein Project will operate. Secondly, it provides a detailed regional situation analysis for the provincial, district and surrounding communities. The data used in the desktop study analysis were sourced from the district (Sekhukhune District) and local municipality (Fetakgomo Tubatse) integrated development plans (IDPs).

Field and site investigations were undertaken by the Gudani team within the project area and foot-print to identify all socio-economic issues, impacts and risks. This phase also included some public participation process and stakeholder engagement process. A ten (10) page questionnaire made up of multiple choice questions on demographic information, employment and economic activities of the community, settlement and infrastructure, agricultural activities, educational information, health information and social grants was developed but could not be administered due to Covid-19 epidemic restrictions and regulations.

16.9.2. Description of issues and risks

16.9.2.1. Modelling results

No modelling was conducted as part of the Socio-Economic Assessment.

16.9.2.2. Other issues and risks

- Noise:
  - During the Operational Phase the impact of noise from various aspects and equipment will be of medium negative significance taking cognizance of the occasional open cast pits, blasting and the rural nature of the area. The impact will be low for the Mahlagari village and medium for the informal settlements within the Tweefontein mine. The earth moving equipment and blasting together with grinding and stone crushing activities will generate noise above ambient noise levels in the surrounding areas.
  - During the Decommissioning and Closure phase noise levels will revert to pre-mining ambient levels when the construction activities and mining activities come to an end. Depending of the volumes of available waste rock, the crushing operations may continue even after Tweefontein Project closure. The impact will be of low negative significance for the duration of waste rock crushing post mining operations.
- Air pollution:
  - Impacts during the Construction and Operational Phase is considered a moderate negative significance. The dust generated during the construction phase and operational phase of the surface mine infrastructure and mining of the opencast pits will reduce the air quality of the local area immediately adjacent to the mining works. The ore crushing and waste rock disposal activities will also generate dust. Dust impact will be high after blasting events. The dust and vehicle emissions generated by the mining activities will reduce the air quality of the immediate local area.
  - Once the mining activities, rehabilitation and re-vegetation over the entire surface are complete no further dust will emanate from the mining site. There will be no dust or any other emission. Dust will however be generated from the existing gravel access road if used for other purposes subsequent to mining access – if these are not upgraded to tar. This will however conform to the surrounding ambient levels.
- Light and Visual:
  - During the construction and operational phase the visual impact is negative and of high significance since the mine opencast areas and surface infrastructures will be visible

to the surrounding village and from the R555 national road for the entire life of mine. The impact is highly negative from the nearby community point of view, due to intensified loss of scenic values – beyond what existed prior to the commencement of the proposed activities. However, the existing mining operations render this impact to be of low significance.
  - Progressive rehabilitation will be implemented throughout the life of mine, such that as closure approaches a significant portion of the mining site would have been rehabilitated to conform to surrounding environmental characteristics and topographic features. This is subject to strict implementation and compliance with this environmental management programme report. Over time and towards closure the visual impact should gradually change from high to moderate and low after final rehabilitation is complete.
- Land use and capacity:
  - The Tweefontein mine construction and mining operational activities will add to the existing negative impacts of air pollution due to dust, visual impacts due to mining, restricted access, loss of grazing land, and loss of land for cultural or traditional practices. There will a moderate negative impact on the bio-physical aspects of the land (portion 1, 3(RE), 4, 5(RE), 6 and 9 of the farm Tweefontein 360 KT) due to exiting mining operations. The active mining areas are already fenced-off and access to the land is restricted due to safety reasons. The nearby communities are therefore deprived of the notion of "the sense of place" and their respective sentimental attachments to their ancestoral land
  - The positive impact of mining in the project area include increased business opportunities, greater demand for goods and services, pressures for housing (ability to own houses), etc. Housing developments adjacent to the mine may also improve the value of land in nearby communities. The economic benefits will therefore be of high positive significance.
- Cultural and Heritage aspects:
  - There has been no record of any archaeological or heritage sites identified within the preferred site footprint for the proposed tailings storage facility at Tweefontein Mine, but the existence thereof is possible.
- Crime, Covid-19 and HIV:
  - Influx of foreigners and job seekers and increase in disposable income for local people may create negative social impacts such as crime, alcoholism and prostitution in and around the project area. This will result in moderate to high negative impacts to the surrounding communities.
- Economic Opportunities, Infrastructure Development and Employment:
  - During the construction and operational phase the impact will be positive to the local and regional economy and those who will get jobs at the mining operation. The number of actual jobs and contracts that will be created renders the mining operation to be of high positive significance. This will further be enhanced by the possible secondary economic activities that may arise within Fetakgomo-Greater Tubatse Local Municipality. Increase in disposable income may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.
  - The Tweefontein Project will inject revenue and income to local residents during the over 20 year life of mine. Skilling and training of local people will make them more marketable to other industries in the region. LED projects will continue to sustain economic activity post Tweefontein Project after closure and decommissioning.

16.9.3. Significance assessment

The results if the socio-economic impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Tweefontein mining operation is provided in Table 9-1 and Table 17-1.

16.10. New Tailings Storage Facility

As part of the TSF design, assessments were done on the potential of dam breakage (Taililngs Solutions, 2020).

16.10.1. Methodology used

Four breach locations were considered in the dam breach assessment (one breach on each side of the TSF) as indicated in Figure 16-17. Quantitative assessment of the potential consequences of a flood from a TSF dam breach requires an estimate of the volume of water and tailings released in the breach, peak outflow discharge, physical characteristics of the breach (height, width, and side slopes), and an estimate of how quickly the breach would occur (duration of failure). Dam breach characteristics for the Sunny-day and Rainy-day scenarios are described below.

The following assumptions were used for the failure scenarios:

Sunny day	Rainy day
• TSF basin slope of 1:300. • Pool depth of 300mm. (Equal to a pool depth of 3 penstock rings) • The outflow volume in the breach was estimated as the sum of free water and mobilized tailings.	• TSF basin slope of 1:300. • Pool depth of 300mm. (Equal to a pool depth of 3 penstock rings) • Total Dam footprint area of 26,880 m^2. • 1:100/24hr rainfall event of 125mm. • The outflow volume in the breach was estimated as the sum of free water and mobilized tailings

The volume of mobilised tailings for a Sunny-day and Rainy Dam Breach Failure is presented in Table 16-2.

Table 16-2: Volume of mobilised tailings - Sunny day and Rainy scenario

Breach Scenario	Volume of free water (m^3)	Volume of mobilised tailings (m^3)	Total Dam Breach Discharge volume(m^3)
Sunny-Day	2 544.69	2 544.69	5 089.38
Rainy Day	Operational Water: 2 544.69 Storm water: 23 418.13	25 962.82	51 925.63

STRM topography data at a Resolution of 12 m x 12 m raster and a vertical accuracy of 2 – 4 m was obtained from Airbus WorldDEM Satellite Imagery.

The volume of mobilized tailings was added to the volume of water exiting the TSF during the breach and it was assumed the solids would get suspended and transported with the flood wave, referred to as liquified tailings or a Newtonian fluid.

The rheological parameters (tailings viscosity and yield stress) were not taken into account but were assumed equal to that of water. In reality, some of the sediment released from the TSF may settle along the way, and therefore, the volume of the flood wave may decrease in the downstream direction resulting in smaller inundation areas.

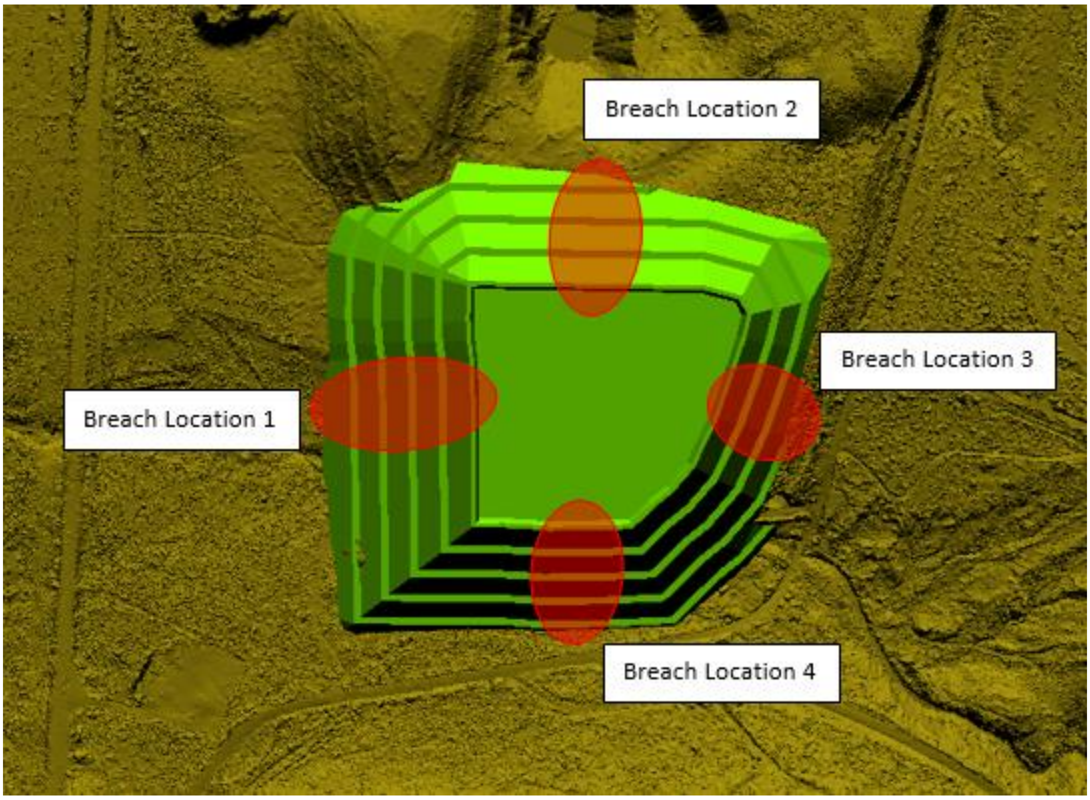


Figure 16-17: Simulated dam breach locations (Taililngs Solutions, 2020)

16.10.2. Description of issues and risks

16.10.2.1. Modelling results

The maximum water depths measured in overall Sunny-day models are presented in Figure 16-18. Maximum water depths measured in overall Rainy-day models are presented in Figure 16-19.

The model results and the inundation maps (Appendix 1 in the Taililngs Solutions (2020) report) for the sunny day and rainy scenario indicate that high water levels would cause inundation of the following key areas:

- Tweefontein public road downstream of TSF; and
- Flow of tailings into the Dwars River, which ultimately flows into the Steelpoort River.

A breach to the North of the TSF would cause flooding and damage to the Pit excavations to the North and North-East of the new TSF.

16.10.2.2. Other issues and risks

Not applicable.

16.10.3. Significance assessment

The potential impacts on the surface water resource as a result of failure of the TSF is provided in Table 9-1 and Table 17-1.

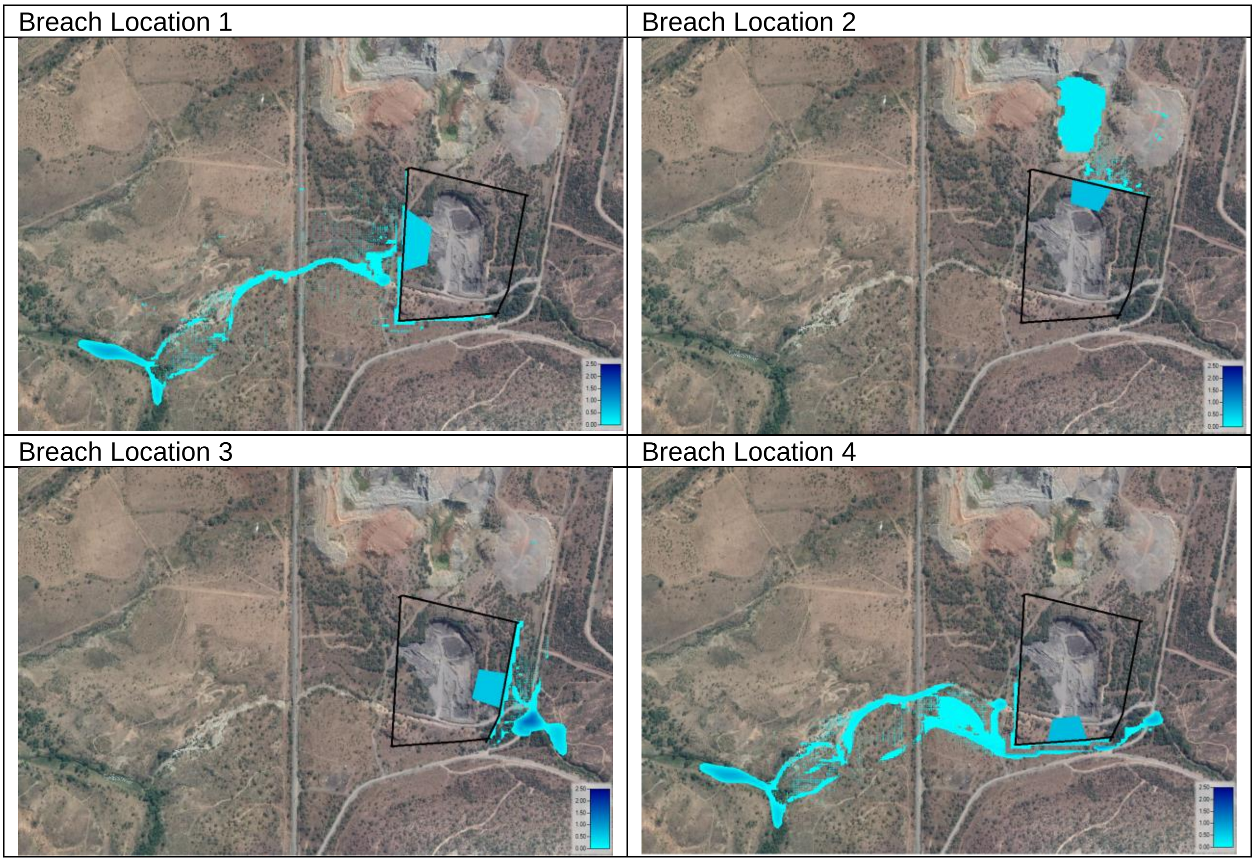


Figure 16-18: Max water depth - Sunny day breach failure

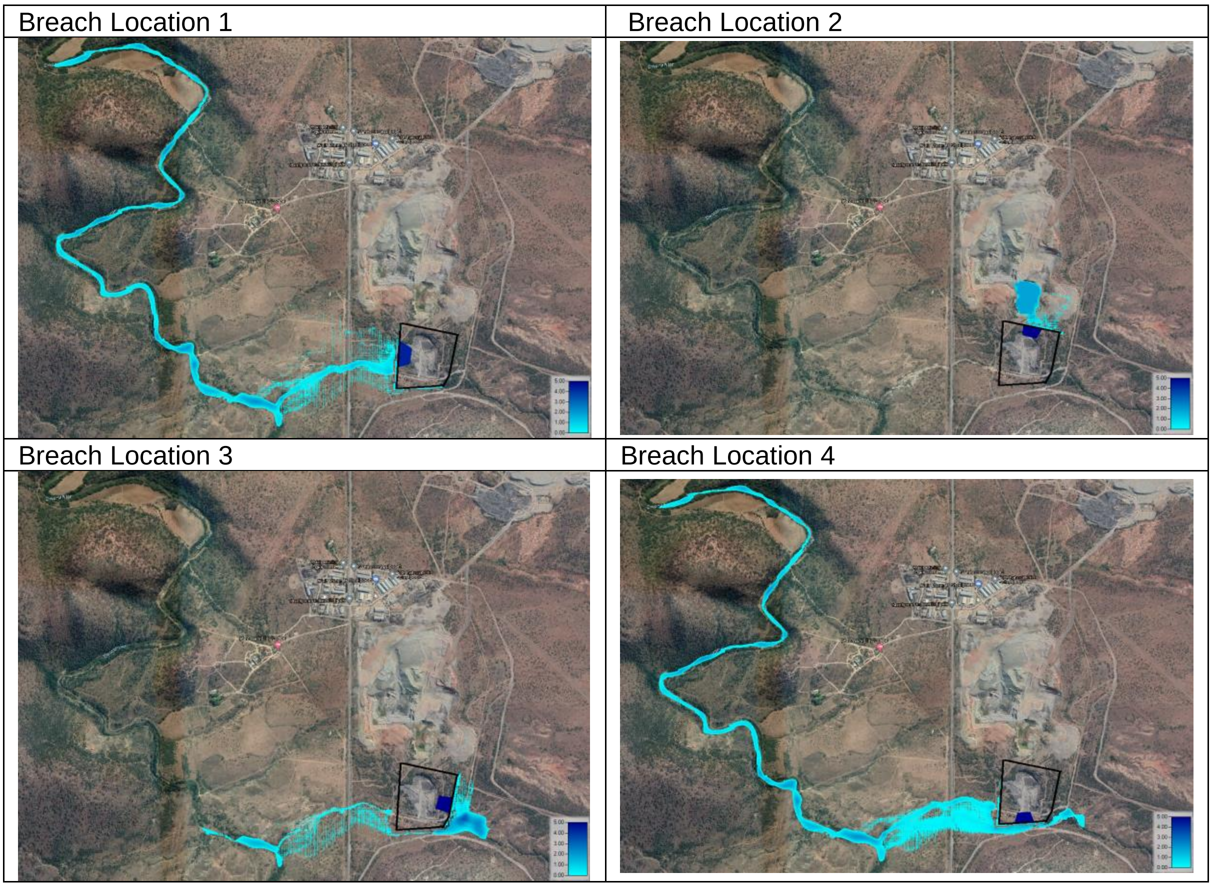


Figure 16-19: Maximum water depth - Rainy day breach failure

17. ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties). The supporting impact assessments conducted by the EAPs are attached in Appendix 7.

Table 17-1: Assessment of each identified potentially significant impact and risk

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2020	New Tailings dam at TWF3 and old pit	Development related activities will lead to destruction of highly sensitive habitat (VU1) and overall loss of biodiversity within the clearance area. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Flora	Co, Op,	Medium to High	Control Planning Rehabilitation	Medium
2020	New Tailings dam at TWF3 and old pit	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	Flora	Co, Op	Low to medium	Control Monitoring	Low
2020	New Tailings dam at TWF3 and old pit	Development related activities may lead to the loss of floral species of conservation concern. Sixty-one (61) plant species listed on the SANBI database for the area are classified as species of conservation concern (SCC) according to the IUCN Red	Flora	Co, Op	Medium	Control Planning Removal Monitoring	Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		List status, the ToPS list, their endemism, the NFA and the LEMA. Six plant SCC were identified to occur on the proposed project footprint during the site survey. Development and related activities are likely to impact on the sensitive habitats related to the watercourses situated in and around the development footprint.					
2020	Waste rock dump expansion	The WRD extension is largely planned on an area which forms part of VU4, which is highly degraded. Development related activities will not lead to significant destruction of habitat and overall loss of biodiversity.	Flora	Co, Op	Low	Control Planning	Low
2020	Waste rock dump expansion	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	Flora	Co, Op	Low to medium	Planning Monitoring Control	Low
2020	TWF3 and pit tailings dam	TWF3 (where the opencast exists and will be backfilled) will suffer less severe ecological impacts due to the impacted nature of the area inside the existing mine. This activity could fragment ranges that certain animals	Fauna	Co, Op	Medium to High	Planning Education Removal Rehabilitation	Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		may need to sustain adequate foraging area and breeding grounds.					
2020	TWF3 and pit tailings dam	Constructing activities and heavy construction vehicles entering into natural areas might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat	Fauna	Co, Op	Medium to High	Planning Rehabilitation Education	Medium
2020	TWF3 and pit tailings dam	Possible impacts on Species of Conservation Concern (SCC) associated with the area is a possibility, specifically if TSF1 is the chosen alternative. However, no nationally red listed species were observed during the field assessment, but is could still occur based on the condition of the habitat observed. Provincially listed species have been noted and impacts to these should be prevented and no hunting, catching or relocation of any species should occur without authorisation under LEMA. The expansion of the WRD is not expected to bring forth ecological impacts, since the area designated for development falls within the dirty footprint where the WRD already occurs.	Fauna	Co, Op	Medium	Planning Rehabilitation Education	Low to Medium
2020	TSF and WRD development	Impacts to the wildlife during the operational phase of the TSF and WRD developments could occur, depending on alternative utilized. TSF1 will have more severe	Fauna	Op,	Medium	Planning Rehabilitation Noise control Light control	Low to Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		ecological impacts than TSF3 and the expansion of the WRD. The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. The impacts are foreseen to be less severe than Construction phase, the threat of this stage is not the magnitude of the impact, rather the duration. This continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).					
2020	WRD Expansion	The construction activities might result in impacts on the natural environment, however, the footprint proposed for the WRD has been already developed and fall within a designated fenced area. The remaining natural environment within these areas were found to be already impacted as the current WRD is already located here.	Fauna	Co, Op	Low to medium	Planning Education Rehabilitation	Low to Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2020	WRD Expansion	Traffic and constant usage of heavy vehicles might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat. However, the area had already been fenced and occurs within an already impacted footprint, therefore, the occurrence of animal species and usable habitat within this area is not expected and impacts will remain low.	Fauna	Co, Op	Low to medium	Planning	Low
2020	WRD Expansion	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. Since this is the extension of the WRD, these are already present on site and will only continue.	Fauna	Op,	Low to medium	Planning Rehabilitation Noise control	Low
2020	Site clearance for WRD expansion and TSF development	During this activity, a number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above-mentioned operations will have its own duration and potential for dust generation. Fugitive dust (containing TSP (total	Air quality	Co,	Low	Planning Management Rehabilitation	Low

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)) It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This activity will be short-term and localised, seizing after construction activities. Material will be removed by using a bulldozer and then storing this material separately for use during rehabilitation at end of life of mine when the operation cease. These construction sites are ideal for dust suppression measures as land disturbance from clearing and excavation generates a large amount of soil disturbance and open space for wind to pick up dust particles and deposit it elsewhere (wind erosion). Issues with dust can also arise during the transportation of the extracted material, usually by truck and shovel methods, to the stock piles. The dust can further be created by the entrainment from the vehicle itself or due to dust blown from the back of the bin of the trucks during transportation of material to and from stockpiles					

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2020	Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, drilling, drilling blasting, etc.)	During this phase, it is anticipated there will be construction of infrastructure. This will include, access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust). The construction of roads take place through removing the topsoil and then grading the exposed surface in order to achieve a smooth finish for vehicles to move on. Temporary stockpiles will be created close to the edge of the road in order to be backfilled easily once the road has expired or need to be rehabilitated.	Air quality	Co,	Low	Dust management Planning Rehabilitation	Low
2020	General transportation, hauling and vehicle movement on site	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and	Air quality	Co,	Low to Medium	Dust management Speed management Planning Rehabilitation	Low

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.					
2020	Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	Increase in PM10 concentrations was not predicted to exceed 75 µg/m³ limit for any of the sensitive receptors. The annual average PM10 limit of 40 µg/m³ are predicted not to exceed at any of the identified sensitive receptors for the unmitigated or mitigated scenarios.	Air quality	Op,	Low	N/A	Low
2020	Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	No sensitive receptors are predicted to exceed the monthly dust fallout for the highest month residential limit of 600 mg/m²/day. The predicted annual dust fallout for the unmitigated and mitigated scenarios are not predicted to exceed the annual limit of 300 mg/m²/day at any of the sensitive receptors	Air quality	Op,	Low	N/A	Low

Year	**Activity**	**Potential Impact**	**Aspects affected**	**Phase**	**Significance Without Mitigation**	**Mitigation Type**	**Significance with Mitigation**
2020	New TSF, WRD Expansion	Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture.	Flora	Cl, Post Cl,	Medium	Planning Monitoring Control Rehabilitation	Low to Medium
2020	New TSF, WRD Expansion	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area the same manner as may be expected in the construction phase, although these impacts are short term and followed by increased habitat restoration and decreased movement within the area. The possibility exists for rehabilitation to be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance.	Fauna	Cl, Post Cl,	Low to Medium	Rehabilitation Education	Low to Medium
2020	Demolition and removal of all infrastructures including transportation of site	The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its	Air Quality	Cl, Post Cl,	Low	Planning Maintenance Dust management	Low

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions. The impacts will be short-term and localised. Any implication or implications this phase will have on ambient air quality will seize once the activities are finalised					
2020	Rehabilitation (Spreading of soil, re-vegetation and profiling / contouring)	During this activity, there is the reshaping and restructuring of the landscape. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Air quality	Cl, Post Cl,	Low to Medium	Rehabilitation Planning Maintenance Dust management	Low
2020	Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	Noise	Op,	Low	N/A	Low
2020	Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	Noise	Op,	Low	N/A	Low

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2020	Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Surface water	Op, , Cl, Post Cl,	Medium to High	Control through management and Planning	Low to medium
2020	Storm water management for the new TSF and associated infrastructure	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.	Surface water	Op, , Cl, Post Cl,	Medium	Control through management and Planning	Low to medium
2020	Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	Noise	Co,	Low	N/A	Low
2020	Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	Noise	Co,	Low	N/A	Low
2020	Construction of the New TSF, TSF reclamation and WRD Expansion	Disturbance / Loss of the Soil Resource	Soils	Co,	High	Management Rehabilitation Planning	Medium
2020	Ineffective housekeeping and management of stockpiles and exposed soils as a result of TSF construction, TSF	Disturbance / Loss of the Soil due to erosion as well as contamination	Soils	All phases	Medium to High	Management Rehabilitation Planning	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
	reclamation and WRD expansion						
2020	Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Cumulative disturbance, loss and degradation of soils	Soils	Pl, Co, Op,	Medium to High	Management Rehabilitation Planning	Medium
2020	Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Increased / Decreased sediment loads on downstream systems	Soils	Cl,	Medium	Management Rehabilitation Planning	Low to medium
2020	Stripping of soils, Clearing of vegetation and stockpiling of materials as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss / Sterilization of inherent land capability and land use.	Land capability and land use	Pl, Co, Op,	Medium	Management Rehabilitation Planning	Low to medium
2020	Continued clearing, disturbance, laydown, stockpiling and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Loss of land services, ecosystems support and services	Land capability and land use	All phases	Medium	Management Rehabilitation Planning	Low to medium
2020	Access road and stream diversion construction activities	Disturbance / loss of soil resources	Soils	Co,	Medium	Management Rehabilitation Planning	Low to medium
2020	Ineffective housekeeping and management of stockpiles and exposed soils as a result of the	Disturbance / loss of soil due to erosion as well as contamination	Soils	All phases	Medium	Management Rehabilitation Planning	Low

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
	Access road and stream diversion						
2020	Continued activities inclusive of mining and transportation as a result of the access road and stream diversion	Cumulative Disturbance / loss and degradation of soils	Soils	All phases	Medium	Management Rehabilitation Planning	Low
2020	Continued activities inclusive of mining and transportation as a result of the Access road and stream diversion	Increased / decreased sediment loads on downstream systems	Soils	Cl,	Medium	Management Rehabilitation Planning	Low to medium
2020	Stripping of soils, clearing of vegetation and stockpiling of materials for road and river diversion	Disturbance / loss / sterilisation of inherent land capability and land use	Land capability and land use	Pl, Co, Op,	Medium	Management Rehabilitation Planning	Low
2020	Continued clearing, disturbance, lay down, stockpiling and transportation for road and river diversion	Cumulative Disturbance / loss / sterilisation of inherent land capability and land use	Land capability and land use	All phases	Medium	Management Rehabilitation Planning	Low
2020	Vegetation removal	Vegetation removal (though already disturbed footprint area) could result in siltation of the watercourse should this activity occur during the rainfall season. As a result of the vegetation removal, the existing flow regime and micro habitats created by the existing diversion would be altered.	Surface water	Co,	Medium to High	Planning Management Storm water management	Low to medium
2020	Vegetation removal	The potential for hydrocarbon spills from machinery working within 100 m from a watercourse is a possibility.	Surface water	Co,	Medium to High	Planning Management	Low
2020	Diversion of the unnamed tributary around the new	It is recommended that a formal river diversion be designed around the new footprint area of the TSF and	Surface water	Op,	Medium to High	Planning Management	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
	TSF and associated infrastructure	associated infrastructure. This will have a positive impact on the flow regime, habitat, water quality and biota of the watercourse and allow for the connection of the upstream and downstream area.				Authorisations Inspections	
2020	Diversion of the unnamed tributary around the new TSF and associated infrastructure	Negative aspects associated with the construction of the proposed diversion may include siltation and temporary impacts on flow regime, habitat and biota.	Surface water	Co,	Medium to High	Planning Management	Low to medium
2020	Diversion of the unnamed tributary around the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Surface water	Co,	Medium to High	Planning Management	Low
2020	Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Surface water	Co,	Medium to High	Planning Management	Low to medium
2020	Storm water management for the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Surface water	Co,	Medium to High	Planning Management	Low
2020	Construction of the TSF and associated infrastructure liner system	During construction of the TSF and associated infrastructure impacts on water quality due to siltation as a result of the loosening of material may occur. The potential impacts on the surface water quality could impact on the habitat and biota of affected watercourses.	Surface water	Co,	Medium to High	Planning Management	Low to medium
2020	Construction of the TSF and associated infrastructure liner system	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if	Surface water	Co,	Medium to High	Planning Management	Low

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		incorrectly lined / liner is damaged may impact on baseflow water quality.					
2020	Operation of the TSF and associated infrastructure	No additional impacts on the flow regime is expected as it is covered in the storm water management required for the site. During the operational phase leachate from the TSF and associated infrastructure if the incorrect liner is installed or of the liner is damaged may impact on the baseflow water quality.	Surface water	Op,	Medium to High	Planning	Medium
2020	Operation of the TSF and associated infrastructure	Spills from the pipeline would result in impacts on the water quality (should the tributary be flowing at the time). If spills are not cleaned it could result in base flow water quality impacts. This in turn could impact on the habitat and the biota.	Surface water	Op,	Medium to High	Management	Medium
2020	Operation of the TSF and associated infrastructure	TSF breaching could result in impacts on water quality, habitat and Biota should a break occur on the east, south or western sides of the TSF. The potential range of the impact has been modelled by Tailings solutions.	Surface water	Op,	High	Management	Medium
2020	Backfilling of the historic pit area with Tailings	No liner is possible in the pit thus it will not be possible to reduce leachate to the baseflow of the watercourse. This will have an impact on the baseflow water quality of the watercourse and have a negative impact on the water quality in the Dwars river. Please also refer to the geohydrological assessment.	Surface water	Op,	Medium to High	Monitoring	Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2020	Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The increase in soil to act as a capping material may result in wind-blown dust and potential siltation that could impact on biota and the habitat. The vegetation of the TSF and associated infrastructure is a positive aspect.	Surface water	Cl, Post Cl,	Medium to High	Planning Management Rehabilitation	Low to medium
2020	Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	During the closure phase the movement of machinery may result in hydrocarbon spills that could impact on water quality, biota, habitat and vegetation.	Surface water	Cl,	Medium to High	Planning Management	Low
2020	Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The potential of leachate generated by the TSF and associated infrastructure is still a possibility and could result on impacts on quality, biota and vegetation.	Surface water	Cl, Post Cl,	Medium to High	Monitoring	Medium
2020	Re-mining of TSF facilities	Pumping of mobilised fines across the diverted tributary could impact on water quality, habitat and biota should a spill occur.	Surface water	Op,	Medium to High	Management	Low to medium
2020	Re-mining of TSF facilities	Should the liner system be compromised as a result of the re-mining this could impact on the surface water quality, habitat and biota.	Surface water	Op,	Medium to High	Planning Methodology Monitoring	Medium
2020	Construction of the new TSF and the WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	Visual	Co,	Low	Management	Low
2020	Permanent nature of the new TSF and WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	Visual	Op, Cl, Post Cl,	Low to medium	Planning Management Rehabilitation	Low
2020	New TSF (TWF1 or TWF3 options)	Pollution Plume	Groundwater	Cl, Post Cl,	Medium	Design, Planning, Monitoring	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2020	Existing TSF	Pollution Plume	Groundwater	Cl, Post Cl,	Medium	Monitoring	Low to medium
2020	WRD	Pollution Plume	Groundwater	Cl, and post Cl,	Low to medium	Monitoring	Low
2020	Underground Mine - planned, inclusive of surface facilities	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	Groundwater	Cl, Post Cl,	Low to medium	Monitoring	Low
2020	Underground mine - Existing	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	Groundwater	Cl, Post Cl,	Medium to High	Monitoring	Medium
2020	Underground Mine - planned	Dewatering could result in < 1 m water level decline	Groundwater	Op,	Medium to High	Monitoring	Medium
2020	Underground mine - Existing	Dewatering could result in < 1 m water level decline	Groundwater	Op,	Medium to High	Monitoring	Medium
2020	Cumulative of all activities	Pollution Plume	Groundwater	Op, Post Cl	Medium to High	Monitoring	Medium
2020	TWF1 option	Potential impact on artefacts.	Archaeological	Op,	High	Collection and preservation of artefacts	Low to medium
2020	Movement of trucks, excavators and other mining equipment.	Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active. The noise levels will increase to 90 - 100 dBA during day time (5h00 – 19h00). Rock breakers and blasting for the excavation during mining operations will generate noise levels of 100 – above 120 dBA respectively. The closest village (Mahlagari) to Tweefontein is 8 km away and less	Socio Economic	Op,	Medium	Maintenance Planning Personal protective equipment Compliance with guidelines and safe practises	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		likely to be impacted due to it being further away from the site. Noise rating for activities similar to that proposed at Tweefontein mine vary between 50 dB (A) and 57.8 dB (A).					
2020	Cumulative of all activities	The noise impacts of the proposed Tweefontein Project and exiting Mahlagari village (08km) and retail/commercial activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	Socio Economic	All	Low to Medium	As above	Low
2020	Movement of trucks, excavators and other mining equipment, including mining activities	Controlled movement of haul trucks and light delivery vehicles (LDVs) around the site will generate some nuisance dust into the atmosphere. Dust will also be generated from the opencast pits, access roads to and from the open pits and crusher/plant sites.	Socio Economic	All	Low to Medium	Dust suppression Monitoring Personal Protective equipment Rehabilitation	Low to medium
2020	All	Cumulative impact on air quality	Socio-Economic	All	Low to Medium	As above	Low
2020	All	Visual impact will result from the visual contrast of the site with the surrounding areas due to the following factors: § The crushing and screening activities create a high visual contrast with the surrounding areas, which are greener and less uniform. In the first phase of rehabilitation, trees and natural vegetation will be used to disguise or buffer the mine workings	Socio Economic	All	Medium	Rehabilitation Planning	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		as far as possible and provide some degree of stabilization of the substrate; § The position of the mine workings, tailings storage facility and waste rock dump above the R555 Road, which raises it above the level of any naturally occurring tree, making it more visible; § The relatively undeveloped nature of the surrounding area immediately reveals the presence of man-made infrastructure and man-made forms (straight lines, bold colours etc.) The proposed SECM Tweefontein opencast activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine will be visible from R555 main road.					
2020	All	The proposed additional mining infrastructure at Tweefontein Mine may form part of the “sense of place” in the long term, even after operations cease.	Socio Economic	All	Low to medium	As above	Low to medium
2020	All	The construction and expansion of the Tweefontein mine surface infrastructure including crushing and screening plant, tailings dam, waste rock dumps, access roads and opencast pits will require topsoil stripping and clearing of vegetation. The inherent land capability will be	Socio Economic	All	Medium	Rehabilitation Planning	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		permanently lost below the footprint of these mining entities. The severity of the impact is considered to be of moderate to high significance. The reason for the moderate severity is that the land is zoned for mining and currently being mined by SECM. The proposed opencast pits and mining infrastructure will not alter the land use at the mine footprint due to current mining activities at the Tweefontein mine. The additional mining infrastructure will add to the existing impacts of air pollution due to dust, visual impacts, and extraction of water for mining purposes due the existing mining operations. There is no major impact on the land use since the area is already zoned for mining. The positive impact of mining in the project area include increased business opportunities, greater demand for goods and services, pressures for housing (ability to own houses), etc.					
2020	All	Cumulative impacts on land use due to secondary industries that may be developed around the areas to provide support services and material to the mine. Urbanization and modern residential developments also likely.	Socio Economic	All	Low to medium	As above	Low to medium
2020	TSF and WRD development	Three (3) archaeological sites were identified in the TSF1 area during the September 2020 (A. Pelser)	Socio Economic	C, O	Medium		Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		fieldwork, dating to the Stone- and Iron Age periods, but there is a high likelihood that more are located in the TSF1 area and in the expansive erosion donga that is partially situated within the area and bordering the area. It is therefore important that the TSF1 area be studied in more detail as part of Phase 2 Archaeological Mitigation before mining activities commence. TSF1 is not the preferred site for the proposed tailings facility and therefore the said three sites will not be impacted on.					
2020	All	Any further mining development will form part of the history of the local area. No other cumulative impacts are anticipated.	Socio Economic	All	Low to medium	Implementing Policies and plans Community participation	Low to medium
2020	All	Crime is commonly in most settlement areas and the community of Mahlagari is not different. However, due to the rural nature of the settlements, crime may be lower comparative to urban centres such as Burgersfort. The traditional livelihoods and sharing of communal resources in rural settlements also minimizes crime to some extent. Crime and HIV statistics in Mahlagari village have NOT been verified in this SEA study, however as a general norm influx of foreign people and job seekers in communities adjacent to large scale projects such as the	Socio Economic	All	Medium	Implementing Policies and plans Community participation	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		Tweefontein mine project is inherent. HIV and crimes such as theft, sex crimes, traffic violations, fraud and drugs are possible, and likely to increase if not managed and policed because of the Tweefontein mine project. Influx of foreigners and job seekers and increase in disposable income for local people may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.					
2020	All	Cumulative impact on Crime, Covid-19 and HIW	Socio Economic	All	Low to Medium	As above	Low to Medium
2020	All	Mahlagari village is a village in Steelpoort and the closet and most likely to be affected by to the Tweefontein mine project. It is characterized by rural to semi-rural settlements with high levels of poverty and high unemployment levels as well as low literacy levels. The region's economy is derived from a variety of sectors, of which mining and agriculture are the main contributors. A high percentage of residents in the local village of Mahlagari are unemployed. The mine will alleviate this unemployment problem, though it will not eradicate it completely. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The life of mine (LOM) is expected to be over	Socio Economic	All	Medium to High	As above	Medium to High

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
		20 years, which translate to 20 years and more of economic activity in the region. The social and labour plan (SLP) to be implemented by the SECM Tweefontein Project will contribute to the development of the adjacent community in terms of skills training, local economic development projects, and improved infrastructure.					
2020	All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Crime impacts	Socio Economic	All	Low to Medium	As above	Low to medium
2020	All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Employment impacts	Socio Economic	All	Medium	As above	Low to medium
2020	TSF Operation	Potential loss of resource and life should TSF dam failure occur on northern wall	Socio Economic	Op,	High	As per TSF failure under Surface water	Medium
2015	Opencast mining and Underground mining areas	Loss of chrome resource	Geology	Op,	High	None	High
2015	Opencast mining areas	Voids left as a result of chrome removal at Opencast areas	Topography	Op,	High	Remedy Rehabilitation Design measures	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Impact on pre-mining and operational topography	Topography	Op,	Medium to High	Remedy Rehabilitation Design measures	Low to medium
2015	All	Loss of topsoil during stripping, handling and placement on rehabilitated areas	Soils	Op,	Low to medium	Remedy Rehabilitation Design measures	Low to medium
2015	All	Loss of topsoil fertility as a result of changes to the physical, chemical and biological soil properties which could affect the potential land use	Soils	Op,	Medium	Remedy Rehabilitation Design measures	Low to medium
2015	All	Contamination of soils by fuels and lubricants from mining and associated equipment	Soils	Op,	Low	Remedy	Low
2015	All	Change of land use from wilderness to mining and back to wilderness	Land capability	Op,	Medium to High	Rehabilitation	Medium
2015	All	Impact on wilderness land used for mining activities	Land use		High	Rehabilitation	Low to medium
2015	Opencast mining and Underground mining areas	Management of un-mined land at Tweefontein	Land use	Op,	Low	Design measures	Low
2015	All	Loss of rare plant species that occur on site	Natural vegetation / plant life	Op,	Medium to High	Design measures Avoidance Relocation	Low to medium
2015	All	Growth of alien invasive plant species on site	Natural vegetation / plant life	Op,	Medium	Monitoring Remedy	Low to medium
2015	All	Loss of species diversity and habitat characteristics due to mining	Natural vegetation / plant life	Op,	Medium to High	Remedy Rehabilitation	Low to medium
2015	All	Loss of indigenous animals	Animals / Fauna	Op,	Medium to High	Planning Control behaviour Education	Low to medium
2015	All	Reduction in surface water quantity (volume of water to the receiving environment)	Surface water	Op,	Medium to High	Design controls Planning Treatment storm water	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
						controls Rehabilitation Monitoring	
2015	All	Impact on surface water quality	Surface water	Op,	Medium	Design controls Planning Treatment storm water controls Rehabilitation Monitoring	Low to medium
2015	Opencast and Underground mining	Alteration of the natural river / water courses	Surface water	Op,	Medium to High	Planning Design parameters Rehabilitation	Medium
2015	All	Lowering of groundwater levels due to mining related activities	Groundwater	Op,	Updated as per 2020 assessment	Rehabilitation Monitoring Compensation	Updated as per 2020 assessment
2015	All	Negative impact on groundwater quality as a result of mining activities and tailings dams	Groundwater	Op,	Updated as per 2020 assessment	Rehabilitation Monitoring Compensation	Updated as per 2020 assessment
2015	Operation of Tailings facilities	Elevated water levels due to recharge from tailings dams	Groundwater	Op,	Low to Medium	Monitoring	N/A
2015	All	Impact on air quality as a result of operation dust and gaseous emissions	Air quality	Op,	Medium	Dust control Monitoring Vehicle servicing Rehabilitation	Medium
2015	Opencast mining	Mining operations within open pit area will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Air quality monitoring and quantification	Medium
2015	Processing plans, Stockpiles, opencast and Underground mining	Material handling operations will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Medium
2015	Processing plants	Crushing will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Vehicle entrainment on unpaved roads will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium to High	Dust control	Medium to high
2015	All	Vehicle entrainment on paved roads will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Medium
2015	All	Continuous rehabilitation activities will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Medium
2015	Tailings dams	Wind erosion from tailings dam will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium to High	Rehabilitation	Medium to High
2015	Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Rehabilitation	Medium
2015	Overburden and waste rock dump	Wind erosion from overburden / waste rock storage pile will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Low to medium
2015	ROM Stockpiles	Wind erosion from ROM storage piles will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Low to medium
2015	Opencast mining	Drilling and blasting activities – opencast will impact on Dust fallout (nuisance dust)	Air quality	Op,	Medium	Dust control	Low to medium
2015	Opencast mining	Mining operations within open pit area will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Medium
2015	Processing plants and Opencast mining, stockpile areas	Material handling operations will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Medium
2015	Processing plant	Crushing will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Medium
2015	All	Vehicle entrainment on unpaved roads will impact on Respirable dust (PM10)	Air quality	Op,	Medium to High	Dust control	Medium to High

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Medium
2015	All	Continuous rehabilitation activities will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Medium
2015	Tailings dams	Wind erosion from tailings dam will impact on Respirable dust (PM10)	Air quality	Op,	Medium to High	Dust control	Medium to High
2015	Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Medium
2015	Overburden and waste rock dump	Wind erosion from overburden / waste rock storage pile will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Low to medium
2015	ROM Stockpiles	Wind erosion from ROM storage piles will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Low to medium
2015	Opencast mining	Drilling and blasting activities – opencast will impact on Respirable dust (PM10)	Air quality	Op,	Medium	Dust control	Low to medium
2015	Opencast mining	Blasting of overburden and reef will impact on Gaseous emissions	Air quality	Op,	Low to Medium	Vehicle control	Low to medium
2015	All	Release of exhaust emissions from vehicles on paved and unpaved roads will impact on Gaseous emissions	Air quality	Op,	Low to Medium	Vehicle control	Low to medium
2015	Underground mining	Release of underground emissions due to diesel operating machinery will impact on Gaseous emissions	Air quality	Op,	Low to Medium	Control	Low to medium
2015	All	Increased noise levels as a result of the mining activities above acceptable levels	Noise and Vibration	Op,	Medium	Noise control Planning Monitoring	Low to medium
2015	Opencast	Risk to humans and equipment as a result of fly rock	Noise and Vibration	Op,	Medium to High	Planning Design	Low to medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Sensitive landscapes present in the vicinity of Tweefontein are the Steelpoort River and Dwars River floodplains and riparian zones.	Sensitive landscapes	Op,	As per surface water assessment	As per surface water assessment	As per surface water assessment
2015	All	Visibility of the mining activities may impact on the sense of place, visual equity	Visual aspects	Op,	Medium	Visual control Planning Design Rehabilitation	Medium
2015	Opencast	Damage to the village from the recent past	Archaeological and cultural interest	Op,	Low to Medium	Planning Authorisations	Low
2015	Opencast	Graveyard may be damaged by mining operation	Archaeological and cultural interest	Op,	High	Education Planning	Medium
2015	Opencast	Destruction of mining heritage remains	Archaeological and cultural interest	Op,	High	Authorisations	Medium to high
2015	All	Influx of job seekers into the area	Socio-Economic structure	Op,	High	Planning Policy Implementation Communication	Low to medium
2015	All	Impact on community safety as a result of mining activities	Socio-Economic structure	Op,	Medium	Planning Control	Low to medium
2015	All	Increase in Social pathologies due to influx of job seekers	Socio-Economic structure	Op,	Low	Planning Policy implementation	N/A
2015	All	Accommodation and social services limitations	Socio-Economic structure	Op,	Low	Planning Policy implementation	N/A
2015	All	Road maintenance and safety	Socio-Economic structure	Op,	Medium	Planning	Low to Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Safety of Children	Socio-Economic structure	Op,	Low to Medium	Planning Control	Low to Medium
2015	All	Aesthetics and impacts on sense of place	Socio-Economic structure	Op,	Medium	Planning Control	Low to Medium
2015	All	Potential Health impacts	Socio-Economic structure	Op,	Low to Medium	Planning Health Assessments	N/A
2015	All	Influx of job seekers into the area	Socio-Economic structure	Op,	Low	Planning Policy Implementation	N/A
2015	All	Employment and income generation	Socio-Economic structure	Op,	Medium	Planning Policy Implementation	N/A
2015	All	The use of current employees as construction workers	Socio-Economic structure	Op,	Medium	Planning Policy Implementation	N/A
2015	All	Increase in indirect employment opportunities and local expenditure	Socio-Economic structure	Op,	Medium	Planning Policy Implementation	N/A
2015	All	local and regional economic benefits and multipliers	Socio-Economic structure	Op,	Medium to High	Planning Policy Implementation	N/A
2015	All	Growth in the local housing sector	Socio-Economic structure	Op,	Low	Planning Policy Implementation	N/A
2015	All	Development of BEE and SMME opportunities	Socio-Economic structure	Op,	Low to Medium	Planning Policy Implementation	N/A
2015	All	Corporate and social investment	Socio-Economic structure	Op,	Low to Medium	Planning Policy Implementation	N/A
2015	All	No additional impacts expected	Geology	Re, Cl, Post Cl	N/A	N/A	N/A

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	No additional impacts expected	Topography	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Soils	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Land capability	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Land use	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Natural vegetation / plant life	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Animals / Fauna	Re, Cl, Post Cl	N/A	N/A	N/A
2015	Opencast	Effect of final void on catchment yield	Surface water	Re, Cl, Post Cl	Medium	Rehabilitation	Medium
2015	All	Effect on surface water quality	Surface water	Re, Cl, Post Cl	N/A	Rehabilitation Infrastructure maintenance	N/A
2015	Opencast and Underground mining	Possibility for Decant from mining operations	Groundwater	Re, Cl, Post Cl	Low to Medium	Rehabilitation Planning Modelling Planning	Low to Medium
2015	Tailings dams	Elevated water levels due to recharge from the tailings dam	Groundwater	Re, Cl, Post Cl	Low	N/A	N/A
2015	Tailings dams	Nitrate pollution from migration from tailings dam	Groundwater	Re, Cl, Post Cl	Low to Medium	N/A	N/A
2015	Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Low to Medium	Rehabilitation Control	Low to Medium
2015	Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	All	Infrastructure removal will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Vehicle entrainment on unpaved roads will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	All	Vehicle entrainment on paved roads will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	All	Infrastructure removal will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Low to Medium	Dust control	Low to Medium
2015	All	Demolition of infrastructure – blasting will impact on Gaseous emissions	Air quality	Re, Cl, Post Cl	Medium	Vehicle control Dust control	Low to Medium
2015	All	Tailpipe emissions from vehicles will impact on Gaseous emissions	Air quality	Re, Cl, Post Cl	Low to Medium	Vehicle control	Low
2015	All	Increase in noise levels as a result of demolition of infrastructure	Noise and Vibration	Re, Cl, Post Cl	Medium	Noise control Planning Monitoring	Medium
2015	All	No additional impacts expected	Sensitive landscapes	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Visual aspects	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	No additional impacts expected	Archaeological and cultural interest	Re, Cl, Post Cl	N/A	N/A	N/A
2015	All	Cessation of employment	Socio-Economic structure	Re, Cl, Post Cl	Medium to High	Policy Implementation Planning	Low to Medium

Year	Activity	Potential Impact	Aspects affected	Phase	Significance Without Mitigation	Mitigation Type	Significance with Mitigation
2015	All	Reduced economic activity	Socio-Economic structure	Re, Cl, Post Cl	Medium	Policy Implementation Planning	Low to Medium
2015	All	Potential re-employment of employees	Socio-Economic structure	Re, Cl, Post Cl	Low	N/A	N/A
2015	All	Changed land-use after rehabilitation	Land use	Re, Cl, Post Cl	Low to Medium	Rehabilitation	N/A

18. SUMMARY OF SPECIALST REPORTS

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form). Copies of specialist reports are attached in Appendix 7.

Table 18-1: Summary table of specialist recommendations

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations	Reference to applicable section
		- that have been included in the EIA report (Mark with an x where applicable)	*- of report where specialist recommendations have been included*
Air quality (EcoElementum Environmental and Engineering, 2020)	Material handeled wet at material handling areas as is the current practise .	X	Part A Table 20-1 Part B: Section 6
	Revegetation on the sides of the TSF and WRD are recommended to prevent wind erosion during the operational phase.	X	Part A Table 20-1t Part B: Section 6
	Ambient air quality monitoring should be expanded to get a baseline condition prior to the onset of the expansion operations and in order to establish the level at which the proposed operations are noted to impact on the ambient air quality.	X	Part B Section 8.1 Part B Table 8-1 Part B: Section 6
	Fallout monitoring should be continued for the life of mine to better assess the level of nuisance dust associated with both mining and process related operations. Sampling of fallout should be undertaken within the neighbouring areas as well as on-site. Expansion of the dust fallout monitoring is recommended at the locations as shown in Figure 8-2.	X	Part B Section 8.1
	Further measures that should be applied, if it is found that dust fallout are measured to be exceeding limits are: Real-time passive indicative monitoring to the obtain quantitative data as to the source of the emissions.	X	Part A Table 20-1 Part B Section 8.1 Part B: Section 6
	The impacts from dust fallout and Particulate matter can be reduced by implementing dust control measures as described above.	X	Part A Table 20-1 Part B: Section 6
	The highest intensity of the construction work should be carried out during the summer months and not over the harsh winter months as can result in increased dispersion of fugitive dust.	X	Part A Table 20-1 Part B: Section 6
	The mine should ensure that unpaved roads are continuously watered and treated with dust binding additive products to reduce the volume of fugitive dust emitted from unpaved roads.	X	Part A Table 20-1 Part B: Section 6

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations	Reference to applicable section
	To limit cumulative impacts it is recommended that a combination of engineering controls, dust suppression measures, rehabilitation of exposed surfaces, operational procedures, and measurement of ambient air quality is implemented.	X	Part A Table 20-1 Part B: Section 6
Archaeological (Pelser, A., 2020)	None Applicable to the preferred TWF3 footprint area.	N/A	N/A
	TWF3 is the recommended site.	X	Part A Section 6.1.1.2
Biodiversity	Mitigation measures as recommended in the specialist report and included in the EMPr.	X	Part A Table 20-1 Part B Section 6
	TWF3 is the recommended site.	X	Part A Section 6.1.1.2
	Prior to construction it is recommended that the new areas be fenced and animals should be allowed to freely move away to ensure that they are not harmed and not require specialist relocation. If relocation or intervention is required, a specialist should be consulted to ensure the correct path of action is chosen.	X	Part A Table 20-1 Part B Section 6
Noise (EARES, 2020)	Due to the low significance of the noise impact no management conditions are recommended.	X	Part A Table 20-1 Part B Section 6
	No active environmental noise monitoring is recommended due to the low risk of a noise impact occurring. However, should a reasonable and valid noise complaint be registered, the mine should investigate the noise complaint as per the Section 14.1 in the specialist report.	X	Part A Table 20-1 Part B Section 6
Soil, Land us and Land capability (ECO Soil, 2020)	The soil erosion at the TWF1 and TWF3 should be rehabilitated.	X	Part A Table 20-1 Part B Section 6
	Various mitigation measures as indicated in the specialist report and the EMPr.	X	Part A Table 20-1 Part B Section 6
	As soon as material is stockpiled for use as top soil it is recommended to take samples to analyse and interpret the soil chemical condition.	X	Part A Table 20-1 Part B Section 6
	A soil sample from the topsoil of the stockpiles should be analysed before and after rehabilitation commences in order to make a proper fertiliser recommendation.	X	Part A Table 20-1 Part B Section 6
	Recommendations for the rehabilitation of soils used as top-soil seeding layer over the discard dump and tailing facilities as indicated in section 14.3 of specialist report	X	Part A Table 20-1 Part B Section 6
	Monitoring recommendations as provided in the specialist report and the EMPr.	X	Part B Section 8.7
Surface water	It is recommended that the Present Ecological Status of the Dwars River be improved and that it does not deteriorate further.	X	Part B Section 8.8

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations	Reference to applicable section
(Prescali Environmental Consultants, 2020)	With regards to the ephemeral unnamed tributary it is recommended that no further impacts that could result in destabilising the beds and banks occur to prevent further erosion of the banks that could result in siltation downstream.	N/A	The tributary will be diverted.
	TWF1 was the preferred option	N/A	TWF3 was the final selected area
	Various management and mitigation measures as indicated in	X	Part A Table 20-1 Part B Section 6
	Various monitoring requirements as indicated	X	Part B Section 8.8
Visual (EcoElementum Environmental and Engineering, 2020)	It is recommended that the environmental authorities consider the overall cumulative impact on the existing mining character and the areas sense of place before a final decision is taken with regard to the optimal number of mining activities in the area.	N/A	Authorities
	Various mitigation and management measures as outlined	X	Part A Table 20-1 Part B Section 6
Geohydrological (GPT, 2020)	An extended hydrocensus must be conducted in the areas that could be impacted every five years to update the groundwater status and to determine the impact on the groundwater if any.	X	Part A Table 20-1 Part B Section 6 Part B Section 8.5
	Users within areas that could be affected, should be monitored at least on an annual basis to establish a baseline against which future impacts can be compared, and protect the mine against unwarranted claims.	X	Part A Table 20-1 Part B Section 6 Part B Section 8.5
	The water quality in the Dwars River must be measured monthly upstream and downstream of the mining area to be able to prove no negative impact from mining on river water quality.	X	Part A Table 20-1 Part B Section 6 Part B Section 8.5
	Assessment of groundwater impacts and update of the model must be conducted on a five-year interval to incorporate latest groundwater measurements and future mining plans.	X	Part A Table 20-1 Part B Section 6 Part B Section 8.5
	Groundwater monitoring (levels and quality) is recommended and the Monitoring network should be extended over time.	X	Part A Table 20-1 Part B Section 6 Part B Section 8.5
	The TSF should be lined with the appropriate liner material as dictated by the waste classification of the tailing's material.	X	Part A Table 20-1 Part B Section 6
	A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the TSF is diverted clear of the deposit.	X	Part A Section 3.2.2.1
	The monitoring boreholes should be sited using geophysical methods in order to identify geological structures that may act as preferential flow paths for contaminant transport. These monitoring boreholes will also serve the purpose to	X	Part A Table 20-1 Part B Section 6 Part B Section 8.5

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations	Reference to applicable section
	measure groundwater levels as well as to gather groundwater quality data to determine the impact of the new developments at Tweefontein Mine. These boreholes need to be added to the current monitoring programme and need to be monitored on a monthly basis		
	Monitoring boreholes drilling should be supervised by a qualified hydrogeologist and care should be taken to accurately log the geology during drilling and construct the boreholes appropriately	X	Part A Table 20-1 Part B Section 6
	The aquifer parameters should be measured by conducting an aquifer test (pump test, slug test etc.) on each of the newly drilled boreholes. 24-Hour pumping tests are recommended. This information can be used to update the numerical with accurately measured parameters.	X	Part A Table 20-1 Part B Section 6
	A re-evaluation of the risk to the aquifer should be conducted every 2 years	X	Part B Section 8.5
Socio Economic (Gudani Consulting, 2021)	To reduce the impact of the cutting on the topography and restore the landscape character to closely resemble the conditions prior to the opencast pits, the following is recommended: • Studying the contour map of the site and mimicking the surrounding areas on the final earthworks plan as closely as possible without excessive cost as part of the final phase of rehabilitation; • Stabilising the substrate/backfill material by means of a variety of metal-tolerant grasses, shrubs and trees; • Screening the road as far as possible with indigenous trees, grasses and shrubs	X	Part A Table 20-1 Part B Section 6
	Heritage: Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist; Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in order to verify the presence or absence of any such material; Any graves in the vicinity of the mining operations will or not be directly affected must be documented and monitored for damage	X	Part A Table 20-1 Part B Section 6

19. ENVIRONMENTAL IMPACT STATEMENT

19.1. Summary of Key Findings of the Environmental Impact Assessment

Based on the specialist assessments conducted in 2020 for the proposed new TSF and the WRD expansion the following key findings were noted:

- Air quality: the proposed expansion activities will not result in PM10 daily concentrations in excess of the 75 µg/m³ limit or in excess of the 40 µg/m³ annual average limit at nearby receptors. In addition the predicted dust fallout at nearby receptors will be less than 600 mg/m²/day (monthly) and 300 mg/m²/day (annually).
- Archaeological: No archaeological impacts are applicable to the preferred site TWF3 and the WRD expansion area,
- Biodiversity: Impacts on both fauna and flora are expected but the significance of the impact will be less at TWF3 than at TWF1 due to the disturbed nature at TWF3 and in fact The TWF3 area was determined to be of significance. Of importance is the fact that Tweefontein is located within the Sekhukhune Mountain Bushveld vegetation type.
- Noise: During the construction phase slightly elevated noise levels may occur as a result of the TSF construction, however considering the existing ambient sound levels, it is highly improbable that the proposed construction and operational activities will impact on the ambient sound levels at identified sensitive receptors,
- Soil, land use and land capability: The area has no dominant agricultural value and there are severe concerns regarding the condition of the soils and the presence of soil erosion (sheet, rill and donga) on almost the entire site.
- Surface water: the site TWF1 was the preferred option, however additional management measures are proposed that will make TWF3 an acceptable option especially as the unnamed tributary of the Dwars River has been impacted by historic mining activities and has been diverted previously to allow for opencast mining.
- Visual: The construction and operation phase of the proposed Tweefontein project related activities and its associated infrastructure will have a LOW-MEDIUM visual impact on the natural scenic resources and topography.
- Geohydrological: During the operational phase a drawdown cone of less than 1 m is expected. A pollution plume that could result in increased sulphate levels of between 100 – 500 mg/l is predicted post closure though no decanting is expected. This plume will reach the Dwars River.
- Socio economic:
    - The study indicates that a majority of the households are comprised of core family and extended family- although it may be a custom for the majority of rural villages to live as single family units with parents and their children and grandparents. Even with this evidence it has come to light that some households are headed by children or grandparents. Communal are not a standard practise. Even though large margins of the household members are unemployed, most of them bring income through social grants and the rest of the unemployed individuals are either trading or receive cash gifts. Agricultural activities are very minimal in the village. Amongst the employed, a small number has received formal education therefore bring in minimal wages.
    - Almost all households have made their residences permanent and more than half of them live in brick houses that they own although some may be inherited or family homes. Based on the analysed data, it is evident that most of these households depend on public taps to get water. Only a small amount has piped water in their households. Almost all the studied households make use of natural resources for survival on a daily basis.
    - The village fall outside the Fetakgomo-Greater Tubatse Municipal boundary for services, therefore do not have services such as rubbish removal, sewage reticulation, and access roads/streets. Sanitation facilities are pit or septic tank methods. This poses

further risk of underground water pollution which is the main source of potable water for the communities.

- There is a very high unemployment rate – especially amongst young people who have completed matric certificate. These young people can be further trained in various skills that may be required by the proposed SECM Tweefontein proposed project. The mine will alleviate the unemployment problem, though it will not eradicate it completely.
- Social unrest and crime are expected to be relatively low in the village due to its rural nature. This is likely to change due to the Tweefontein proposed activities and result in influx of foreigners in the village, therefore policing plans must be development in conjunction with the respective village.
- The proposed Tweefontein project will add to the economic development of Fetakgomo-GreaterTubatse Local Municipality in terms of capital investment, job creation, infrastructure development, services and foreign exchange. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop due the proposed Tweefontein activities. The Environmental Authorisation (EA) is expected to be for 20 years, which translate to 20 years of economic activity in the region. The construction phase is expected to be for a period of 2 years.
- Social well-being and social justice are meant to create a positive outcome meaningful for people and societies. Well-being and improved way of life should be considered as the main areas of protection to assess social impacts of operations such as mining. In addition, equity and equality need to be addressed in terms of social justice to ensure a fair and ethic society.

19.2. Final Site Map

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 .Attach as Appendix 4.

Please refer to Appendix 4.

19.3. Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

Table 19-1: Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Aspect	Positive implications / risks	Negative implications / risks
Air quality	TWF3 will have less of an impact that TWF1.	PM10 and nuisance dust levels will increase marginally but are still within acceptable limits.
Archaeological	There are no archaeological findings at TWF3.	Archaeological findings are close to TWF1.
Biodiversity	TWF3 is an already disturbed area.	Negative impacts on fauna and flora diversity and habitat as a result of the TSF development and the WRD expansion.
Noise	TWF3 will have less of an impact that TWF1.	Noise levels will increase marginally but are still within acceptable limits.
Soil, Land use and Land capability	TWF3 will have less of an impact that TWF1. Rehabilitation of areas are recommended as priority action.	Loss of the soil resource and land use and land capability,

Aspect	Positive implications / risks	Negative implications / risks
Surface water	With the selection as TWF3 as the preferred option additional management measures are recommended that could result in the tailings waste being classified as a Type 4 rather than a Type 3 waste which will have less of an impact. The construction of a new diversion could assist with the current erosion in the existing diverted watercourse.	If not managed correctly the impact on surface water habitat could be exacerbated and even more siltation and erosion could occur at the unnamed tributary.
Geohydrological	N/A	Both TWF1 and TWF3 options will result in pollution plume though it will take longer for the TWF3 plume to reach the Dwars River.
Socio-economic	Further economic activity	Existing socio-economic impacts will remain e.g. noise, air quality, light and visual, Land use and capacity, Cultural and heritage, Crime, etc.
Continuation of existing Tweefontein mining and support activities	Employment opportunities and contribution to the GDP	As above.
Premature closure of the Tweefontein operations	Existing negative impacts status quo will be maintained.	Loss of employment opportunities and contribution to GDP.

20. 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.

From the approved EMPr dated 2013 approved in 2015 which included the objectives of the previous approved EMPr as well as the specialist studies conducted in 2020 the following management objectives and outcomes were identified. A detailed outline of the management aspects and mitigation measures to be implemented is provided in Part B, Section 6.

Table 20-1: Management objectives and outcomes

Aspect	Objective	Outcome
Air quality	• To minimise the deterioration in air quality due to wind-blow particulate matter arising from the opencast pit, rehabilitated areas, tailings dam and from vehicle emissions. • To determine the impacts on the surrounding environmental resultant of ECM's operations. • To reduce emissions from the site. • To reduce the impact on air quality as a result of dust.	• Compliance with applicable Legislations relating to prescribed air quality parameter limits. • No complaints from I&APs relating to dust impacts.
Geology	• To reduce the impact left be voids.	• Voids to be rehabilitated as far as possible.
Groundwater	• To minimise the impact of loss of the shallow weathered shale aquifer within the opencast areas and underground and associated draw down in local groundwater level. • To minimise the impact of loss of base flow to the Steelpoort and Dwars Rivers. • To minimise any negative impact on existing users with regards to lowering of the water table and water quality impacts. • To manage the long-term impacts of mining on groundwater, specifically the impacts relating to decant (it should be noted that based on the 2020 geohydrological assessment that no decant is expected). Recovery of water levels in the surrounding area after closure to the pre-mining levels must also be considered. • To limit the long term impact on groundwater quality. • To demonstrate whether opencast mining areas and underground pits impacts on adjacent groundwater users, and to gather data that will allow a predictive understanding of pit/groundwater interaction. • To reduce or prevent decant and impact on surface water resources. • To gather data that will allow a predictive understanding of the groundwater environment and how it will be affected by surface activities.	• Compliance with DWS reserve determination and water quality objectives. • Detailed records of groundwater monitoring data that can be used to show trend lines and possible impacts relating to water levels and water quality.
Soils	• To minimise the loss of topsoil during stripping, handling and placement on rehabilitated areas (preservation of topsoil). • To maintain or improve the pre-mining fertility status of usable soil. • To prevent / reduce the impact on soils as a result of hydrocarbon spills.	• Soil is fertile and suitable for use when needed.
Land capability	• To limit the adverse effects of mining on the post mining land use capability.	• After closure and decommissioning the land use is achieved and the site is self-maintaining.
Land use	• To facilitate the sustainable and productive use of rehabilitated land. • To ensure the continued fitness of the natural areas that is still to be mined, or which lies outside of the mining footprint.	• After closure and decommissioning the land use is achieved and the site is self-maintaining.

Aspect	**Objective**	**Outcome**
Terrestrial Biodiversity	• To minimise the adverse effects of mining on indigenous fauna, by preventing the needless death, injury or hindrance to fauna particularly with regard to protected, endemic and species of conservational concern. • To minimise the impact on rare plant species by preventing the needless loss of or damage to flora particularly with regard to protected, endemic and species of conservation concern. • Prevent significant alteration to the ecosystems in the area. • To control the spread of, and to eradicate invasive alien flora that could outcompete indigenous vegetation on the whole of the mine site and adjacent areas of the Tweefontein opencast under the management of ECM. The aim will be to rehabilitate towards naturally sustainable vegetation and habitat as was present before the implementation of the project. • To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining. • To demonstrate that the re-vegetated areas have become self-sustaining. • To ensure that rehabilitated land becomes self-maintaining. • Properly assess and determine final land-use and ensure Closure and Rehabilitation Plan is formal, feasible and site specific.	• No Alien vegetation on site. • After closure and decommissioning the land use is achieved and the site is self-maintaining. • No species of conservational concern has been impact.
Noise and Vibration	• To reduce noise impacts of the mining activities on residential areas and nearby land owners. • To minimise the startle effect of blast noise on the receiving public. • To minimise the risk to the public associated with blast fly rock.	• Compliance with recommended noise levels. • No complaints from I&APs relating to noise.
Surface water	• To minimise impacts as a result of the underground mining of the Dwars River. • To reduce the impact on catchment yield as a result of mining activities. • To implement good water management practises. • To reduce and prevent the impact on nearby surface water resources. • To minimise impacts as a result of the underground mining of the Dwars River. • To minimise impacts on watercourses and drainage lines. • To reduce or prevent decant and impact on surface water resources. • General maintenance.	• Compliance with DWS reserve determinations and water quality objectives. • Compliance with the National standard for chrome mine relating to water conservation and water demand management Water use efficiency targets. • All water use are licenced in terms of Section 40 of the National Water Act, 1998 (Act No. 36 of 1998).
Topography	• To reinstate a landform that is similar to the pre-mining environment. • To reduce the impact left by voids. • The post mining landform must be free draining. • To return post mining topography to as close as possible to pre-mining topography.	• After closure and decommissioning the land use is achieved and the site is self-maintaining.

Aspect	**Objective**	**Outcome**
Visual aspects	• To reduce the visual impact of the mining activity and associated equipment and infrastructure.	• Reduces visibility of all infrastructures.
Archaeological and Heritage	• To ensure full compliance with the National Heritage Resources Act (Act 25 of 1999). • To reduce the impact resulting from the destruction of, or damage to, archaeological remains. • To immediately isolate any newly identified areas during the construction phase to avoid further disturbance to the site, to call in an archaeologist and heritage expert and notify the authorities of the find. No further disturbance of the site would take place until information of significant value has been recovered as described above. • To remove and re-inter any graves that occurs within the opencast area in accordance with community wishes and regulatory requirements. Graves not impacted by surface infrastructure within the site will be fenced.	• Compliance with the National Heritage Resources Act (Act 25 of 1999). • Obtain relevant permits as needed for removal of artefacts.
Socio Economic	• To encourage recruitment from local communities and to encourage development within the local community, and skills acquisition. • To encourage effective communication with the local community and an increased standard of living by effectively addressing the concerns of interested and affected parties. • To try and limit influx of migrants. • To encourage effective safety and security measures. • To ensure proper housing is available and that there is sufficient social services available. • To reduce the impact on roads. • To ensure that children are safe. • To reduce the aesthetic impact further. • To reduce / prevent impacts on health. • .To mitigate the impacts of the termination of the project. Mine closure will result in cessation of employment, with a limited number of workers benefiting from closure and decommissioning activities. • To mitigate impact of closure.	• Compliance with the Social and Labour plan as well as the MPRDA requirements.

21. 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)

Tweefontein is an operational mine and this provided limited options for the development of the new infrastructure areas forming part of this amendment. Based on the information and the impact assessments as received from the specialists for the two main options investigated for the new TSF TWF3 was the preferred option. In addition the potential benefit from the additional treatment of the tailings before deposition further provided additional motivation for the use of the TWF3 site (a 6 month pilot project is currently being investigated). The location of the existing pit that will be backfilled as part of the new TSF construction provided an already disturbed footprint area for the new TSF which in turn require the diversion of the unnamed tributary (which is already partially diverted). With regards to the proposed liner system for the new TSF the alternative natural clay liner is the preferred alternative due to the reduced leakage volumes from the use of such liner.

With regards to the WRD expansion the location was predetermined by the footprint of the existing TSF and the already brownfields area.

22. ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

From the available needs and requirements of the Department of Water Affairs Division: Instream Use, the need for a hydropedological assessment was identified. It is recommended that the environmental authorisation include that such an assessment should be conducted if so required by the Department of Water and Sanitation.

All other aspects have been identified and included in the EMPr.

23. DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

(Which relate to the assessment and mitigation measures proposed)

The following assumptions, uncertainties and gaps were identified in the 2020 EMPr assessment.

23.1. Air Quality

Uncertainties with regards to the modelling was noted and this could affect the impacts as identified and thus the proposed management measures.

23.2. Archaeological and Heritage

Although all efforts were made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

23.3. Terrestrial Biodiversity

The desktop study was conducted with up to date resources. It might however be possible that additional information become available in time, because environmental impact assessments deal with dynamic natural ecosystems. It is therefore important that the report be viewed and acted upon with these limitations in mind.

The results, typical flora, herpetofauna, avifauna and mammalian communities found within the study should/can therefore only be used as a general guideline.

In order to obtain a comprehensive understanding of the dynamics of the ecology of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this fauna and flora survey was conducted in one season.

Species flowering only during specific times of the year could be confused with a very similar species of the same genus and some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.

No scientific data was collected or analysed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigator.

The site verification was undertaken during the end of the summer months (March). Climatic and site conditions were suitable for the terrestrial ecology site survey to be undertaken. The general condition and species composition of the site could be established.

Limitations should always be kept in mind and therefore management should focus on pro-active measures and the implementation of the precautionary principle.

The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

23.4. Geohydrological

Whether any contamination will impact on the river is uncertain, as the connectivity between the river and groundwater is unknown. This connectivity could only be established by a separate detailed study of the river and surrounding groundwater levels.

Various assumptions was included and outlined for the model used to determine groundwater impacts and it was assumed that the residue deposits and stockpiles would be lined using composite liners. The modelling was done within the limitations of the scope of work of the study and the amount of data available. Although all efforts have been made to base the model on sound assumptions and has been calibrated to observed data, the results obtained from this exercise should be considered in accordance with the assumptions made. Especially the assumption that a fractured aquifer will behave as a homogeneous porous medium can lead to error. However, on a large enough scale (bigger than the Representative Elemental Volume) this assumption should hold reasonably well.

It is assumed that during closure and decommissioning that the underground mines will be allowed to flood and that the groundwater regime will return to a state of equilibrium.

23.5. Noise

Assumptions and limitations as outlined in the report were made for modelling and noise measurement purposes that could have impacted on the impact description and thus the recommended management measures.

23.6. Soil, land use and land capability

No soil samples were taken for chemical properties of the soils as large areas at proposed site TSF 1 have no topsoil or any soil volume due to sheet erosion, and proposed site TSF 3 is highly disturbed due to previous and present mining activities that would have had an impact on the interpretation of analysis.

There is a possibility that there might not be sufficient volumes of proper uncontaminated topsoil available for rehabilitation and it may have to be sourced from elsewhere.

23.7. Surface water

In order to obtain a comprehensive understanding of the dynamics of the riparian vegetation of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this riparian vegetation survey was conducted in one season. As a result species flowering only during specific times of the year could be confused with a very similar species of the same genus and some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely. The site verification was undertaken during the summer months (March). Climatic and site conditions were suitable for the floral site survey to be undertaken. The general condition and species composition of the site could be established.

The Biomonitoring field assessment was conducted before final site selection has been finalized, but it should not impact on the upstream point utilized and therefore will remain viable, but should be confirmed before follow-up studies are conducted.

The assessment was based on available information as provided by Samancor Chrome Ltd – Eastern Chrome Mines and the detailed design drawings of the proposed TSF and associated infrastructure (inclusive of the proposed river diversion) was not available during the assessment.

23.8. Visual

Various assumptions and limitations were made and identified for modelling purposes that could influence the final impact rating and thus the proposed management measures.

23.9. Socio Economic

Due to Covid-19 epidemic restrictions and regulations the prepared questionnaire was not distributed to the Mahlagiri Village.

24. REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

24.1. Reasons why the activity should be authorized or not

ECM has assessed all potential impacts that could occur as a result of the existing and the proposed new activities and comprehensive management measures has been identified for implementation to reduce the impact rating of the identified impacts as far as possible. Taking the current economic climate of the country in to consideration as well as the positive socio economic impacts that the current and the proposed activities will ensure for the foreseeable future and the impact rating after the implementation of the management measures it is believed that the balance between environment, social and economics will be maintained and thus the activities should be authorised.

24.2. Conditions that must be included in the authorisation

24.2.1. Specific conditions to be included into the compilation and approval of EMPr

- The existing activities are (based on the transitional arrangements) considered to be authorised in terms of the National Environmental Management Act, 1998 and the National Environmental Management Waste Act, 2008.
- Recommendations made by specialist needs to be implemented as far as practical and possible.
- The geohydrological assessment needs to be updated at least every 5 years.
- Monitoring and audits as outlined in the EMPr needs to be conducted as per the locations, aspects and frequencies specified.

24.2.2. Rehabilitation requirements

- Continuous rehabilitation of all available areas (including backfilled opencast sections) needs to be done and a schedule should be drafted for backfilling, topsoiling and vegetation of rehabilitated areas.

24.3. Period for which the Environmental Authorisation is required.

The maximum timeframe of 20 years for the construction, operation and reclamation of the tailings storage facility and WRD is proposed from the date that the Environmental Authorisation is granted. ECM should apply for the extension of the WML as the need arise. In addition, the environmental authorisation should include all the activities as approved in the 2012 EMPr.

For the activities to which a construction phase only is applicable e.g. roads, river diversion, pipeline a timeframe of 2 years is proposed from the date that the Environmental Authorisation is granted.

25. UNDERTAKING

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.

Undertakings by the EAP and Applicant is included in Part C of this document.

26. FINANCIAL PROVISION

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

The Financial Provisioning was determined by ECM for December 2019 as outlined below and this includes all existing infrastructures on site.

Premature (Unscheduled) (at Dec 2019) (Excl. VAT)	Premature (Unscheduled) % Change 2018/2019 (Excl. VAT)	Final (Scheduled) (at Dec 2019) (Excl. VAT)
R170 559 246,93	3,63%	R170 559 246,93

Based on the information provided by the Tailings retreatment contractors the additional financial provision for the new TSF was determined as below.

Description	Unit	Quantity	Gross Liability		Salvage Value		Net Liability
			Rate	Value	Rate	Value	
Remove outlet and penstock	No.	1	R60 000,00	R 60 000,00	R 0,00	R 0,00	R 60 000,00
Remove mechanical equipment and pipes	sum	1	R 10 000,00	R 10 000,00	R 0,00	R 0,00	R 10 000,00
Removal of concrete spillway	m^3	195	R 300,00	R 58 500,00	R 0,00	R 0,00	R 58 500,00
Removal of Starter walls (1634*4*3)	m^3	19 608	R 31,15	R 610 789,20	R 0,00	R 0,00	R 610 789,20
						Total Excl. VAT	**R 739 289,20**

26.1. Explain how the aforesaid amount was derived

Information was provided by Samancor in a spread sheet format already calculated as per the method used to update the information on an annual basis. With regards to the new proposed TSF rates as used by the Tailings retreatment contractor to determine financial provisioning was used and updated using information on the new TSF proposed.

26.2. 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 Prospecting Work Programme as the case may be).

It is confirmed that the financial provisioning amount will be available through operating costs and is provided for the in the mine works programme.

27. DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

27.1. Deviations from the methodology used in determining the significance of potential environmental impacts and risks

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

The surface water impact assessment did not follow the methodology as prescribed in the Scoping report as the method for determining risks and impacts are legislated by Appendix A of Regulation No. 509 of 26 August 2016.

27.2. Motivation for the deviation

The method for determining surface water risks and impacts are legislated by Appendix A of Regulation No. 509 of 26 August 2016.

28. OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24(3)(a) and (7) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) the EIA report must include the: -

28.1. 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 or alluvial diamond prospecting 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 and confirm that the applicable mitigation is reflected in the relevant sections.

Samancor Chrome Ltd is the property and the mineral rights holder on the affected property where the TSF will be located thus no impacts are expected on the company other than if the project does not go ahead it may have serious implications on the mine in terms of employment opportunities and continuation of their core business.

Land claims have been submitted on the applicable properties and from the latest information available has not been finalised as yet.

A detailed Socio-Economic Impact Assessment was done in 2020 (Gudani Consulting, 2021) and the result of the assessment as well as the identified management measures are outlined in Table 20-1 Part A and Table 4-1 Part B.

28.2. IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix) and confirm that the applicable mitigation is reflected herein

None expected, as the Tweefontein Section is an operational mine and the TSF will be located within the mining right area. A Heritage Report will be submitted to the department during the EIA stage. ECM has however to go –ahead with a Phase 2 application to SAHRA to determine the extent and excavate the areas of importance as identified by the archaeological assessment done in 2020. (Pelser, A., 2020)

29. 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).

Section 24 (4) (b) (i) states the following: "*Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment – (b) must include, with respect to every application for an environmental authorisation and where applicable— (i) investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity*;"

A full impact assessment was conducted for the previously approved EMPrs and the information is included in this report. In addition two options for the proposed TSF was assessed and the impacts determined and where applicable modelled.

A number of alternatives with regards to location of the new activities were investigated – there for no motivation is required for deviation in terms of sub-regulation 22(2) h.

-END OF PART A-

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. DETAILS OF THE EAP

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

The information is provided in Section 1.1 of Part A.

2. DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, as required).

The information is provided in Section 3 of Part A.

3. COMPOSITE MAP

(Provide a map (Attached as an Appendix) 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)

Please refer to map provided in Appendix 4.

4. DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

4.1. Determination of Closure Objectives

(ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

Closure objectives were determined as per the approved EMPr and are outlined in Section 4.2.3. In summary the main closure objective is to leave the mining area in a state than are environmentally sustainable with a limited residual impact on environmental aspect so that the surface can be used suitable for grazing and wilderness land.

4.2. The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

4.2.1. Construction phase

To reduce redundancy, the description of those environmental and social impacts predicted to occur as a result of construction activities that are the same as those impacts associated with the mining operations are described in the operations phase below as Tweefontein Section is an operational mine (since the 1970's). With regards to the proposed construction of the New TSF and RWD the construction objectives are to ensure that the impacts of the development are localised to the footprint of the proposed activities.

4.2.2. Operational phase

4.2.2.1. Topography

Issue and Objective: *To reinstate a landform that is similar to the pre-mining environment. The post mining landform must be free draining. This needs to be done as the topography is altered as a result of the construction of surface infrastructure and opencast mining areas as well as waste dumps and water infrastructure.*

- Reprofile replaced hard and soft overburden material to mined out pit areas. Ensure that the reprofiled landform is in keeping with the adjacent un-mined land surface.
- At the contact between pit and un-mined land, ensure slope of ground does not exceed five percent (5%).
- Shape so that the topography is free draining. Reshaped areas of arable land capability must not have a final slope greater than four percent (4%).
- Replace topsoil to achieve required pre-mining land capability. Revegetate rehabilitated areas.

4.2.2.2. Soil, Land use and Land Capability

Issue 1: *Topsoil will be removed and stored during the construction and operational phase in areas where the opencast, surface infrastructure and waste storage areas will be.*

Objective 1: *To preserver topsoil by minimise the loss of topsoil during stripping, handling and placement on rehabilitated areas.*

- Strip all usable soil ahead of mining. This should comprise the entire A-horizon and the majority of the B- horizon material, until 10 percent (10 %) mottling is evident in sub-soils.
- Within the footprint of the opencast area, extra care will need to be taken to recover all usable topsoil; Topsoil must be stripped from the cleared sites as for undisturbed areas.
- Where possible replace stripped soil directly in mined out areas where reprofiling and final shaping have been completed.
- Where soil must be stockpiled, site the topsoil stockpiles up slope or next to, but not down slope of, the mining operation so as to minimise the risk of topsoil contamination.
- All topsoil stockpiles to be protected from erosion by a development of an earth deflection bund upslope of the stockpile.
- If soil stockpiles are going to be left for more than 12 months, vegetate soil stockpiles to minimise soil loss to wind and water erosion. Vegetation to comprise seeding with commercially available pasture grasses.
- Construct surface water control berms on the contour to manage storm water runoff onto rehabilitated sites until such time as the re-established vegetation community has stabilised.
- Establish surface water control berms along the contour on rehabilitated land to control the flow of surface water across rehabilitated land.
- Re-establish drainage lines at a drainage density equal to or greater than the pre-mining drainage density.
- Revegetate placed topsoil areas as soon as possible after placement in order to minimise soil loss to wind and water erosion.

Objective 2: *To preserve topsoil fertility by maintaining or improving the pre-mining fertility status of usable soil.*

- Where possible, place stripped topsoil directly onto reprofiled and shaped areas to minimise the volume of soil that needs to be stockpiled.
- Prior to planting or seeding, conduct routine fertility analysis and fertilise accordingly to create growing conditions that are suitable for plant growth.

Issue: *Wilderness area currently not impacted by the mining activity may become impacted and the existing operations (though in operation since the 1970's) occurred over wilderness area.*

Objective: *To limit the adverse effects of mining on the post mining land capability and to return the large proportion of the land surface currently classified as having wilderness land capability to a wilderness land capability.*

- Reinstate land capability classes with the exception of the area where shallow soils depths occur resulting in classification of the area as having a wilderness land capability. These areas to be returned to wilderness land capability by return of more than 300 mm soil to the reprofiled spoils.
- Re-establish surface drainage and a free draining landform.
- Implement soil protection and conditioning measures.
- ECM to conduct monitoring of rehabilitated areas to assess performance of the rehabilitation approach employed. Rehabilitated areas should be monitored annually to identify:
    - occurrence of surface erosion;
    - vegetation die back;
    - salinization of the soil surface;
    - fertility status of rehabilitated land; and
    - the emergence of alien/exotic vegetation.
- In the event that non-performance is identified, the ECO will implement a plan for corrective action, and will seek the advice of rehabilitation ecologists as required.

Issue: *The study area is currently used for mining and could potentially be used for other uses as well. This use needs to be sustainable.*

Objective 1: *To facilitate the sustainable and productive use of rehabilitated land.*

- Make rehabilitated land areas of wilderness potential available for controlled use as soon as possible in order to facilitate the reintegration of these areas into the regional framework.
- Responsibility for maintenance of rehabilitated areas and reintegration of such areas into the regional environment rests with the ECM ECO.

Objective 2: *To ensure the continued fitness of both the natural grassland areas that is still to be mined, or which lies outside of the mining footprint.*

- The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated.
- Burning of fire breaks around veld areas should be carried out in agreement with neighbouring communities or land owners and permits to burn obtained prior to undertaking activity.
- The ECM ECO will be responsible for management of all land within the mine area of control.
- *Note*: Veld burning will be undertaken in accordance with latest legislation. In grassland areas, burning will occur after the first spring rains when the grass sward is still dormant. This will ensure a cool burn which cause least damage to the plants. Head fires will be used as they also cause least damage to woody vegetation.

4.2.2.3. Terrestrial Biodiversity

Issue: *Mining activities may encroach on natural wilderness areas and result in the establishment of alien invasive plant species.*

Objective: *To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining.*

- Preparation of rehabilitated land areas for re-vegetation.
- Sow the prepared areas with a seed mixture which will produce a grass cover at various levels and over as much of the growing season as possible.

- Note: The seed mixture suggested is indicated below, but may vary somewhat dependent on seed availability, the availability of native seed for incorporation into the mix to be applied to areas of grazing capability etc.
    - Eragrostis tef (teff) 1 - 2 kg/ha
    - Medicago sative (Lucerne) 1 - 2 kg/ha
    - Cynodon dactylon (couch grass)2 - 4 kg/ha
    - Chloris gayana (Rhodes grass)4 - 6 kg/ha
    - Digitaria eriantha (Smuts finger grass) 4 - 6 kg/ha
- Include other native grass seed in the mixture applied when such seed is available.

***Issue and Objective:** To demonstrate that the revegetated areas have become self-sustaining.*

- Include the successive rehabilitated areas of the Tweefontein opencast into an annual land-monitoring programme.
- Appoint an ecologist to carry out vegetation monitoring at regular intervals (two years) within each area that has been revegetated to establish the progression towards self-sustainability in revegetated areas. Monitoring should include assessment of the following:
    - Species abundance and basal cover;
    - An estimation of biomass yield;
    - Index of plant species diversity within the rehabilitated plant community; and
    - Alien and invasive vegetation.

***Issue and Objective:** To control the spread of, and to eradicate invasive alien flora on the mine site and adjacent areas of the Tweefontein opencast under the management of ECM.*

- Inspect all land areas under ECM control annually, at the start of the summer period.
- Map areas of exotic vegetation, should such vegetation develop on the areas of the site outside of the mine pit footprint. Classify areas of infestation as areas of heavy, medium or light infestation. Define the perimeters of these areas and manage as follows:
- Fix the perimeter of each area.
- Actively eradicate any new exotic vegetation outside of the heavily infested areas.
- Starting with the areas of light infestation, actively eradicate the exotic vegetation from within the identified areas.
- Maintain an active follow up programme in cleared areas to control re-growth and seedling establishment and thereby prevent re-infestation of the cleared areas.
- Keep rehabilitated land clear of alien vegetation through regular inspection and clearing of young plants.

***Issue and Objective:** To minimise the adverse impacts of mining on indigenous fauna that leave the areas as a result of the anthropogenic activities as a result of mining.*

- The ECM ECO must interface with the mine planners to manage the development of the mining window in such a manner that the footprint of disturbance is minimised.
- Do not allow hunting or trapping of game or birds on the site.
- Ensure that environmental education of mine staff takes place at all levels to limit unnecessary damage to habitats and/or disturbance of fauna. ECM ECO to develop environmental module to form part of site induction programme. All contractors and staff to attend induction.

4.2.2.4. Surface water

***Issue:** Containment and use of precipitation, excess and storm water on site*

***Objectives:** Reduce impact on catchment yield; Return post mining topography to as close to pre-mining situations as possible; Return surface water flow to original flow areas or as close as possible;*

Design culverts and bridges so that the flood times and water retention do not impact on mining infrastructure.

- Implement storm water management to divert clean water around the mining area.
- Contour shaping of the opencast area to pre-mining topography as far as possible.
- Implement rehabilitation strategy for the stream diversions.
- Design all culverts and bridges with sufficient capacity.

Issue: *Deterioration in water quality as a result of discharges or river diversions*

Objective: *Limit the impact on the Dwars River and its tributaries during construction of the river diversions; Dirty storm water designs to be compliant to Environmental legislation.*

- Construct river diversion infrastructure in the dry season.
- Construct storm water management infrastructure to be compliant to environmental legislation

Issue: *Reduction in surface water quantity due to river diversions, opencast mining and underground mining.*

Objective 1: *Implement the selected river diversion strategy so that surface water quantity to the Dwars River is not compromised.*

- Clean water diversions (bunds and canals) will be constructed and maintained.
- Implement the selected river diversion strategy as per the design document.
- Construct storm water control berms upslope of the active pits to route clean runoff around the open cut and return such water to the Dwars Rivers and its tributaries.
- Rehabilitate mined out cuts and overburden behind the mining face such that the open window in the pit equals no more than five cuts [pre-stripping, mining, overburden placement, overburden levelling, topsoil placement/rehabilitation] with the exception of the main (in-pit and end wall) ramp access.
- Position clean water diversion berms as close to the active mining area as practically possible to minimise the clean run-off that will be intercepted by the pits. The position of such berms should advance as the active mining areas advance.
- All upslope storm water diversion berms are to be constructed to accommodate runoff resulting from the 1:50 year rainfall event.
- Deterioration in surface water quality
- Pit water will be pumped to a return water dam, via silt traps, for use in dust suppression on the mine haul roads. There is little risk of dirty water flowing from the pit. Potential surface water contamination will be limited to pipe bursts between the mining operations and return water dams. The risk of offsite deterioration in surface water quality is further reduced by the planned incremental approach to managing pit water make.
- The stepwise approach that ECM commits to adopt is:
    - All excess mine water will go to return water dams via silt traps,
    - Thereafter, excess water will be used in the processing plant or returned to the natural system.

Objective 2: *Release underground water to the nearest water resource.*

- Monitor water quality and if good discharge to the nearest water resource.
- Investigate water treatment options to treat poor quality water before discharge.

Issue: *Alteration of Drainage patterns.*

Objective 1: *Minimize the impacts on the environment (ecological, economical, and social) due to the alteration of drainage patterns in the project area.*

- In compliance with the GN 704 Regulations (or the latest publication), Samancor will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. It will ensure that its storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event.

- ECM must apply for a Water Use Licence from the Department of Water Affairs before making any changes to the drainage lines.
- The reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed.

Objective 2: *Minimize impact on riparian habitat and restore once mining has finalised.*

- A 100 m buffer zone is placed alongside the "riparian" banks of all water courses and that no further mining should occur within this area.
- The necessary mitigation is put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas.
- "Riparian" habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic. This will be especially important if the flow dynamics of the streams is changed due to discharged water from the site.
- As the streams are generally dry it is not suitable for SASS5 aquatic invertebrate assessment, it is thus proposed that diatom sampling be conducted (if the streams are flowing) before mining commences and as part of the monitoring plan for the mine.
- These sites should mainly consist of an upstream and downstream point in the Dwars River.

Issue: *Contamination of surface water / surface water quality (General).*

Objective: *To ensure compliance with GN 704 Regulations (or latest publication); To prevent discharges of contaminated water to the environment; To prevent pollution of water resources in the vicinity of the project; Recycle and re-use water where possible; Ensure that storm water design complies with DWS regulations and have sufficient capacity; Monitor on site surface water quality and quantity*

- Design and manage all storm water infrastructure to comply with the regulations.
- Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops); No other measures are required as the rest of the area is a "clean area".
- Samancor will implement the surface water control measures in accordance with the requirements of Regulation 704 and the corresponding DWAF M6.1 Operational Guideline. These measures must be implemented during the commencement of the construction phase.
- There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years.
- The operating protocol is as follows: The Crushing and screening Plant beneficiation (including dust suppression) must take water from: The Return water dam(s) unless it is empty; Water from the Void 2 unless it is empty; The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs.
- Samancor will avoid contamination of soils and will implement appropriate remedial measures if incidents of spillage occur.
- Samancor will implement responsible waste management practices.
- Samancor will implement all management measures pertaining to waste and water management as per the design reports.
- The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An

annual report on the project water balance will be submitted to DWS. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall.
- Clean water diversion (bunds/ canals) regularly to ensure capacity is maintained.
- Good housekeeping (clean-up of spills and minimise informal storage of materials).
- Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops).
- Determine leak detection through regular inspection.
- Implement good housekeeping practices e.g. maintenance of equipment and vehicles and for infrastructure located within "dirty area".
- Run-off from roads will be contained.
- Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them
- Monitor quantities and qualities of all water that is discharged.
- Operate the all dams that contain process / return water to have 0.8 m freeboard.
- Design sumps with a 1:50 year holding capacity.
- Implement storm water management before land clearing start.
- The piping that will route pit water back into the return water circuits should be positioned within a contained area wherever possible, or run along the edge of the haul road so that spillage would report within a contained dirty area in the event of an accidental discharge of pit water.
- All process water dams is to be equipped with a float switch to prevent water in excess of the dam's design capacity being pumped into the dam. If the dam has reached its design capacity, no further pumping of water from the pits will thus take place and the pit volume will easily accommodate surge volumes.
- Opencast Pit water must not be discharged directly to any watercourse. The water should be routed to the process water dams for re-use.
- Care must be taken that the storm water berms diverting clean runoff past the pit do not become blocked or contaminated which would result in contamination of the diverted water.

Issue: *Use of potable water.*

Objective: *Reduce volume of potable water used.*
- Install new toilets with a dual flush system.
- Install new showerheads that reduce water use.
- Re-use "waste water" before using potable water in the beneficiation process.

4.2.2.5. Groundwater

Issue: *Opencast and underground mining will result in the loss of or impairment to, the shallow weathered shale aquifer within the pit footprint and will also result in the draw down in local groundwater level in the immediate vicinity of the pit. Although these features cannot be recreated during rehabilitation, effective rehabilitation of the pit concurrent with mining will aid in facilitating the return to a more natural state.*

Objective: *To minimise the impact of loss of the shallow weathered shale aquifer within the Tweefontein opencast pit footprint and Klarinet opencast and underground and associated draw down in local groundwater level.*
- Carry out rehabilitation of mined land concurrent with mining.
- Monitor groundwater in boreholes associated with the opencast pits and those boreholes identified for monitoring in surrounding areas. Where boreholes do not exist, these will need to be drilled in the relevant positions.

- Monitoring of boreholes should be carried out monthly for the first 12 months of operation. Thereafter ECM may choose to motivate to DWS to reduce the groundwater monitoring program to a quarterly frequency, subject to acceptance of the revised monitoring program by DWS.
- Should the opencast mining operation be shown to be impacting on adjacent groundwater users through a reduction in groundwater yield, level, or deterioration in quality, and such impact be consistent with ground water level results from ECM's groundwater monitoring program, then affected parties should be provided with an alternative source of water of equal quantity and quality, or should be compensated for such loss by ECM, and as agreed with land owners.

Issue: *Loss of groundwater contribution to catchment base flow is likely to be minimal, however, certain measures can be taken that will limit any impact on base flow to the Dwars River.*

Objective: *To minimise the impact of loss of base flow to the Dwars River.*
- Rehabilitate mined areas concurrent with mining advance in order to maximise the recovery of clean water runoff.
- Implement surface water control measures to maximise the return of clean runoff to the Dwars River system.

Issue: *Residual impact after closure.*

Objectives: *To limit the long term impact on groundwater quality.*
- Recommendations are made with respect to water and material management strategies, which would mitigate likely Acid Rock Drainage (ARD) and associated water quality impacts during the operational and closure phase of the mining operations. These are summarised as:
  - Effective water management during the operational life of the mine will prevent unnecessary loss of available alkalinity from waste materials. This means prevention of ponding in mining sections and preventing tunnelled sections from flooding whilst operational. Once mined out, flooding of sections should be encouraged as rapidly as possible and the flooded areas should not be allowed to drain again, in order to minimise wetting and drying cycles which exacerbate geochemical weathering.
  - Decant water should be pumped from the highest point if water levels need to be controlled. This will reduce the probability of drawing in oxygenated water towards the base of a water body.
  - Preventing percolation of groundwater through spoil materials. This may be practically achieved by mining from low-lying areas to high lying areas. This strategy prevents salts (alkalinity) from being leached out of the material and allows low lying areas to be flooded once they have been mined, thus reducing or preventing oxygen ingress to reactive sulphides. An added advantage of this strategy is that water storage capacity is created in the mined area. It is thus likely that pumping and treatment requirements will be reduced and that long term water qualities will be better. The overall benefit should translate into a reduced pollution load emanating from the workings and a lower probability of acidification.

Issue: *ECM will manage the long-term impacts of mining on groundwater. The impacts relate in particular to decant. Recovery of water levels in the surrounding area after closure to the pre-mining levels must also be considered. Numerical modelling needs to be undertaken to shown what decant will occur once water levels have recovered to pre-mining levels. The actual volume of decant will need to be confirmed by monitoring. The volumes are predicted to be small, and the potential for poor water quality is limited.*

Objective: *To reduce and minimise the impact on the receiving environment.*
- ECM to implement active intervention measures in the rehabilitated pit areas to capture the decant through active level control in pit. Each pit is to be equipped with a pump controlled by a level switch that will activate the pump when water levels rise to the trigger level.

- ECM ECO to refine pump locations for each pit, in consultation with a geohydrologist, as the floor and lower high wall characteristics are better revealed during mining of each pit. To limit off take of poor quality water that may accumulate in the pit, the pump off take should be positioned off the floor of the pit.
- ECM ECO to ensure that mine water pumping infrastructure is repositioned to meet the long term pit water regulation need of each pit, if required when each pit is mined out, and that such pumping infrastructure is keyed into the piping infrastructure to dispose of this water.

Issue: *The effects of water levels in the surrounding aquifer due to draw down around the open pit and underground mining areas during the mining phase.*

Objective: *To minimise any negative impact on existing users.*
- Monitor possibly affected boreholes for water levels and water quality.

4.2.2.6. Air quality

Issue: *Operational dust from equipment moving on site, crushing, vehicle entrainment, and blasting. Gaseous emissions from vehicles impact on air quality. Control of air quality associated with operational dust.*

Objective: *To minimise the deterioration in air quality due to wind-blown particulate matter arising from the opencast pit.*
- Implement and maintain a dust suppression system on the opencast haul road and service roads associated with the pits.
- Suppress road dust when dust entrainment behind vehicles is noticeable. Install dust fall-out buckets at relevant positions.
- Carry out monitoring of respirable dust.
- Sample dust buckets associated with the pits on a monthly basis and implement corrective action as required.

4.2.2.7. Noise and Vibration

Issue: *A baseline noise assessment should be undertaken to determine impacts, which will be the most pronounced during the night when background noise levels decrease and meteorological conditions favour the transfer of sounds. Dwellings that are likely to be affected by noise should be identified. Control of operational noise levels*

Objective: *To ensure that the noise from the mining activity does not create unacceptable nuisance noise levels due to a sustained increase in noise levels over ambient levels.*
- ECM to construct earth berms in order to screen the operational noise sources from the receiving public. Berms to be in place before commencement of mining.
- Carry out noise monitoring during the operational phase of the pit to ensure that noise mitigation is effective. ECO to appoint independent noise specialist to carry out day time / night time noise monitoring every second year. First assessment to be carried out during first year of operation. Noise specialist to provide ECM with specialist advice on modification of acoustic berms if such berms prove to be ineffective.

Issue: *Blasting typically comprises a single noise event that can be heard over large distances. Wherever possible, all blasts at the Tweefontein section should involve sequential detonation of charges, rather than simultaneous detonation of all charges in order to reduce both noise and ground shock. The impact of blasting noise on people will not be a problem as there are no people near opencast areas.*

Objective 1: *To minimise the startle effect of blast noise on the receiving public.*

- ECM to ensure that the area has been made safe in terms of the MHSA (500 m).
- That all people and livestock are outside of the blast exclusion zone (500 metres) prior to blasting. Use electronic detonators whenever possible.
- ECM to develop and implement a blasting programme that defines a window of time when in the day blasting will occur. This has provisionally been planned for 13h00 – 14h00. ECM to obtain signoff from DMR for this blast management plan, specifically the implementation of special measures that may be required when blasting within 500 meters of the villages.
- ECO to communicate this programme to the public and directly affected landowners (neighbouring farmers, residents of the local village) so that they can anticipate and/identify blasts as being part of the mining operation.
- *Issue*: In order to eliminate the danger of fly rock falling on the public a zone of 500 metres around the point of detonation must be made safe. The DMR will be prescriptive of how mining should be carried out.

Objective 2: *To minimise the risk to the public associated with blast fly rock.*
- Ensure the 500-metre blast exclusion zone is cleared prior to blasting, alternately as directed by the Department of Minerals and Energy in the MHSA / Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).
- Announce all imminent blasts by means of a blast claxton/siren.

4.2.2.8. Sensitive landscapes

Sensitive landscapes present in the vicinity of Tweefontein Section are the Dwars River and its unnamed tributaries and the associated floodplains and riparian zones. These areas is protected by the NWA, NEMWA and no mining activities will take place within the 1:100 year flood line or 100 m from the centre of the watercourse unless authorised through a water use licence. The proposed new TSF will require the diversion of the unnamed tributary and it is thus imperative that the surface water objectives be adhered to as far as possible.

Greenfields areas should be avoided as far as possible and any new infrastructures should be located on already impacted areas.

4.2.2.9. Visual aspects

Issue: *The mining area will be visible from the nearby roads and village. The opencast pit will also be visible from the nearby road.*

Objective: *To reduce the visual impact of the mining activity and associated equipment and infrastructure.*
- ECM to provide screening along the public road. Screening to be in the form of overburden dumps developed alongside roads in order to reduce visual intrusion. No screening will be applied near the Klarinet site due to its topographical nature.
- On completion of mining and successful rehabilitation of the mining area this feature could be removed and the footprint grassed, or it may be left intact, depending on agreement between ECM and the landowner.

4.2.2.10. Sites of archaeological and historical interest

Issue: *Impacts on sites of archaeological and cultural sites that could result in the destruction of artefacts.*

Objective: *To reduce the impact on archaeological and cultural sites.*
- If archaeological sites identified are going to be impacted on by the mining operations, these sites have to be subjected to a Phase II investigation.

- Small excavations may have to be conducted in the site in order to collect material from the site.
- A Phase II investigation of these sites would require that the archaeologist obtain a permit from the South African Heritage Resources Agency (SAHRA), which would also allow for the demolishing of the site after it has been subjected to the Phase II investigation. This aspect will be implemented for the sites (though it will not be impacted) identified during the 2020 assessment done for the new TSF.

4.2.2.11. Socio economic structure

Objective: *To encourage recruitment from local communities.*

- Even though there is no guarantee of securing employment for the local people from the proposed mining activities, a detailed skills survey for the project area should be undertaken.
- There is a need for a clear employment policy that is merit based, gender and race neutral and which
- Offers opportunities for employee advancement.

Objective: *To encourage development within the local community, and skills acquisition.*

- Award bursaries to young people in local communities on condition that the bursary holders are available for vacation employment and apprenticeships.
- Select young local people who possess good educational qualifications for apprenticeship positions. Emphasise the indirect employment opportunities that will come from local contracting by the mine and from the increased local expenditure by mine employees.

Objective: *To encourage effective communication with the local community and an increased standard of living.*

- Establish effective and timeous communication with community leaders.
- Ensure that a transparent procurement process for the mine is adhered to at all times is critical. This should include a database of suppliers available in the areas surrounding the mine, as well as their training and support requirements.
- Implementing an extensive and pro-active HIV/Aids policy and campaign.

Objective: *To encourage effective safety and security measures.*

- Fencing around the opencast and underground mines area to be inspected weekly by the ECO and maintained in competent condition.
- ECO to ensure that signs are erected on all boundary fences warning against entering mining area.

Objective: *To effectively address the concerns of interested and affected parties.*

- Specific issues raised concerning the mine are contained in an independent Issues and Response Report in which comment is provided on each issue raised and, where relevant, a reference is given to indicate where in this EIA and EMPr document the issue of concern has been addressed.
- There is a need however, to provide an on-going means of communication with directly affected parties and ECM.
- A complaints and compliments register should be established and be kept at the mine site office in which any complaint or compliment received is documented, the party responsible for follow-up is indicated and the follow-up actions recorded.
- This register should be kept in an accessible area, probably at the mine administration office front desk. Maintenance of the register to be the responsibility of the ECO.
- The mine manager and ECO must be apprised of any issues raised, within 24 hours of entry into the register. The ECO, in consultation with the mine manager will identify who is responsible to follow up on the issues raised. Contact to be made with the stakeholder within 48 hours of receipt of the issue, and feedback to be provided to the stakeholder that raised the issue, on close out of the issue. The timeframe that will be necessary to address the issue must be communicated during initial contact with the stakeholder.

4.2.3. Closure Phase and Rehabilitation

Issue and Objective: *Maintenance of rehabilitated land to ensure that rehabilitated land becomes self-maintaining.*

- The rehabilitated ground will be monitored for cover and species composition and maintenance will include fertilising, cutting of the grass and replanting open patches of size greater than 2m x 2m.
- According to the contract to be concluded between Eastern Chrome Mines and the accepted Contractor, the Contractor will be responsible for execution of the rehabilitation of the operating area for which they will receive payment. A retention amount will provide for any rehabilitation that will be needed in case of any default with regards to the contractor's responsibility.
- Samancor Chrome will remain the responsible party accountable for the end quality of rehabilitated areas within the mine site.

Issue and Objective: *Maintenance of water pollution control structures to ensure that water pollution control structures remain functional and serve the design requirements.*

- The structures which could require maintenance are:
    - ECM to inspect monthly the storm water diversion channels/berms associated with the routing of storm water around the operating pits. Inspections to be two monthly during the dry season (May to September).
    - ECM to inspect dirty water management infrastructure monthly. Inspection to include pipeline from pit to silt trap and return water dams.
    - ECM to ensure that maintenance work is carried out as required.

Issue and Objective: *Maintenance of residue deposits*

- There will be no residue deposits (with the exception of the WRD and the TSFs) on the ECM property. The site will be fully rehabilitated on completion of mining.
- The WRD will be sloped to ensure safety of post closure land users.
- The TSFs will be rehabilitated as per an approved plan, due to the type of material deposited vegetation may not be possible. The TSFs will be sloped to ensure safety of post closure land users.

Issue and Objective: *The objective for closure of the Tweefontein mining section is to create a free draining post mining landscape that has been returned to a productive post mining land use. The land use is likely to be primarily wilderness with the potential for arable agriculture and livestock grazing. No new fixed infrastructure will be established on closure and all existing infrastructure will be removed. The closure objective regarding groundwater is zero discharge of contaminated water to the environment.*

- The broad approach to closure of the site is detailed in this environmental management program. ECM will develop detailed closure plan at least two years before cessation of mining detailing how they plan to finalise closure of the site.

Issue and Objective: *On completion of mining of the pits and surface mining areas, all supporting mine infrastructure will be removed.*

- Haul roads will have consolidated basement materials lifted and disposed of to pit. Footprint of haul roads will be ripped to a depth of 1.0 meters. Topsoil will be spread over the ripped haul road footprint to a depth of 300 mm and reseeded.
- Pit ramps will be infilled with spoils, reprofiled to be free draining, top soiled and re-vegetated.
- The on-site vent shaft and explosive silos will be removed from site for re-use. Concrete associated with these will be buried on site in the old workings/spoils of the opencast final void and covered with a minimum of one metre of material (inclusive of topsoil layer).
- Piping and water treatment infrastructure will be maintained on site until water quality monitoring data proves that the pit water quality is acceptable for direct release to the receiving environment.

The detailed closure plan that will be developed will address long term water monitoring and maintenance requirements.

- The tailings dam is being reclaimed and processed and the residue will be pumped to voids. The voids will be rehabilitated with stockpiled soils and vegetated. If decanting occurs (highly unlikely), wetlands will be constructed to be passive water treatment facilities. The original dam will be rebuilt in time and has to be rehabilitated.

Issue and Objective: *The Tweefontein resource will be mined by opencast and surface mining methods. The overburden material returned to a pit on completion of mining will seal surface mining areas. The high wall line of all rehabilitated pits will be monitored to detect areas of differential settlement of ground following rehabilitation. Should localised cracking or rat holing be identified*

- ECM to inspect the high wall contact line (line of high wall contact with unmined ground) of all rehabilitated pits annually to identify cracking, sagging or rat holing that may occur due to settlement of materials. Special attention to be paid to the high wall contact above areas where punch or auger mining took place as material may slump into the unfilled underground air space.
- Should cracking, sagging or rat holing along high wall contact be detected, ECO to initiate corrective action which should entail import of fill material and infilling of affected areas. If repaired areas exceed 1 m^2, the area should be reseeded by hand.

Issue and Objective: *Rehabilitation of the opencast areas on site will follow the mining cut and be completed within the operational phase of the project.*

- The proposed mine will be mined by truck and shovel methods. This mining method offers the miner considerable flexibility in placement of material during mining.
- Consequently it is a stated objective of ECM that no final voids will be left in the post-mining topography. All overburden material removed in mining from any individual pit will be returned to a pit and will be shaped to ensure all pit areas are free draining and are returned to pre-mining land capability.

Issue and Objective: *On completion of mining, and subsequent to monitoring having indicated that the post-mining environment is self-sustaining, a detailed closure report will be completed in support of the application for closure of the mine, as required under the MPRDA.*

- The closure plan will address the necessary environmental risk assessment and will include at least the following:
    - An evaluation of surface water quality at monitoring points for the periods September to April and April to September. This will include an evaluation of macro and micro constituents and an overall evaluation of groundwater quality in the monitoring boreholes.
    - Performance audit to reflect compliance with the environmental management programme as described in this EMP. The audit will be conducted by an independent party and will meet the requirements of the Department of Mineral and Energy as stipulated from time to time. Special attention will be given to environmental performance.
    - Review of water balances.
    - Water levels in monitoring boreholes (dual levels).
    - Status of surface rehabilitation of opencast mined areas.

Issue and Objective: *Maintenance of vegetation and surface subsidence/ erosion.*

- Rehabilitated areas of grazing capability will comprise a grass community dominated by grasses of pasture origin. These areas will be managed by grazing. ECM to monitor re-grassed areas as indicated in order to demonstrate the trend towards the areas becoming self-maintaining in these rehabilitated systems.
- On arable areas, a gradual return to wilderness lands will be followed, whereby rehabilitated land will be integrated into the surrounding system as soon as practically possible.
- It is not anticipated that surface subsidence will occur associated with the opencast mined blocks. Some minor settlement may occur, however the pit is located on very gentle slopes and local

settlement is unlikely to result in ponding of water. Special attention will be given to the area along the pit high wall where localised settlement may cause short-term cracking or rat holing. Should localised small depressions cracks or rat holes form however they will be corrected to be free draining (import of soil material, re-grading etc.).

4.3. Potential risk of Acid Mine Drainage

(Indicate whether or not the mining can result in acid mine drainage).

Acid base accounting and NAG tests (SRK Consulting (South Africa) Ltd, 2019) indicated that the waste rock and tailings are currently alkaline and will stay NAF in the long term thus the risk of acid mine drainage is limited.

4.4. Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.

A complete waste classification was done on Waste Rock and Tailings by SRK (SRK Consulting (South Africa) Ltd, 2019) which adopted the approach prescribed by the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation (GN No. R. 632, July 2015) in undertaking the study.

Laboratory analysis of the samples was undertaken by Bureau Veritas M&L Inspectorate Laboratory, a South Africa National Accreditation System (SANAS) accredited laboratory in Johannesburg. The analysis of the test materials included total element chemistry, Acid Base Accounting (ABA), sulphur and carbon speciation, X-ray diffraction mineralogy and analysis of tailings solutions for metals, metalloids and anions.

The updated modelling done by GPT (GPT, 2020) indicated that no decant is expected.

4.5. Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Though not expected suitable liner systems (if possible) will be implemented at all residue deposits as per the designs as approved by the DWS during the water use licence application process.

4.6. Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Though not expected suitable liner systems (if possible) will be implemented at all residue deposits as per the designs as approved by the DWS during the water use licence application process.

4.7. Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Based on the electronic water balance (2018 – 2019 information) Tweefontein section uses the following as process water:

- Intercepts 475 m^3 of groundwater in the underground and opencast workings on a daily basis.
- Direct rainfall that is captured and re-used was determined at 1511 m^3/day.
- Run-off collected for re-use were 649 m^3/day.

4.8. Has a water use licence has been applied for?

Tweefontein has a Water use licence (Number" 04/B41H/ACGI/4398) dated 16 June 2016. An amendment to the water use licence was initiated in 2020 on the e-WULA system with reference WU18192.

4.9. Impacts to be mitigated in their respective phases

Table 4-1: Measures to rehabilitate the environment affected by the undertaking of any listed activity

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
New Tailings dam at TWF3 and old pit	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Flora	Co, Op	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads. It is recommended that red data species be fenced off for additional protection.	Design will be compliant with SANS standards and applicable legislation and be approved by the DWS.	During the planning and construction phase. Monitor vegetation and alien invasive species annually.
				The operational area should be fenced in order to reduce human and vehicle traffic to areas outside of the demarcated mining area.	N/A	Life of mine
				The vegetation removal during the construction phase should be controlled and very specific.	N/A	Before construction begins
				Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should be prioritised.	Pre-impact vegetation	Continually
New Tailings dam at TWF3 and old pit	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Flora	Co, Op	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.	No alien invasive plants on site	Life of mine
New Tailings dam at TWF3 and old pit	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Flora	Co, Op	All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas.	Identify SCC and relocate once permit is received	Before construction commence
				If any SCC are encountered within the subject property in the future, the following should be ensured:		
				If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property.	N/A	As needed
				All rescue and relocation plans should be overseen by a suitably qualified specialist.	N/A	As needed
				Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed.	Permits for relocation in place	As needed

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.	N/A	As needed
Waste rock dump expansion	1,85 Ha expansion area	Flora	Co, Op	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads.	Area for development demarcated	Before construction commence
				The operational area should be fenced in in order to reduce human and vehicle traffic to areas outside of the demarcated operational area.	N/A	Life of mine
				The vegetation removal during the construction phase should be controlled and very specific.	N/A	Construction phase
Waste rock dump expansion	1,85 Ha expansion area	Flora	Co, Op	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.	No alien invasive plants on site	Life of mine
TWF3 and pit tailings dam	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Fauna	Co, Op	The construction area should be well demarcated and construction workers should not enter adjacent areas.	Remove and relocate nests if possible	Before construction commence
				Any nests encountered during the establishment of the TSF should be avoided at all stages.	N/A	Life of mine
				Roads present at TWF3 (within the mine boundary) should be utilised if TWF3 backfilled and developed.	N/A	Continually
				To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continually
				Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.	Pre-impact vegetation	Continually
TWF3 and pit tailings dam	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Fauna	Co, Op	Roads to be utilised during establishment and site clearance should be demarcated and planned to avoid vehicles entering areas which would not have been impacted if proper planning had occurred. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under	Comply with requirements of the EMPr	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.		
				Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.	Pre-impact vegetation	Continually
				Seed mixes should match the surrounding vegetation structures and those specifically found in the Sekhukhune Plains Bushveld and Sekhukhune Mountain Bushveld vegetation types.	Pre-impact vegetation	As needed
				Prevent impacts to the drainage lines identified during the field visit.	Comply with requirements of the EMPr and the Water Use Licence	Continually
TWF3 and pit tailings dam	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Fauna	Co, Op	To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	Comply with requirements of the EMPr	Life of mine
				Corridors between the drainage channels and river systems should always be maintained during construction and operational phases, unless authorised to divert or alter.	Comply with requirements of the EMPr and the Water Use Licence	Life of mine
				Changes that will impact the drainage lines should be subjected to the appropriate rehabilitation of riparian zones and ecological rehabilitation in terms of vegetation to ensure habitat stays favourable for species that may have specialised niches that depend on these aquatic systems.	Comply with requirements of the EMPr and the Water Use Licence	Life of mine
TSF and WRD development	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Fauna	Op	Fencing the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a controlled environment.	Comply with requirements of the EMPr	Life of mine
				Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase is speedily managed and restored. This included erosion and the management of Invasive plant species that may decrease the integrity of the Sekhukhune vegetation types as a specialised habitat for animals.	Pre-impact vegetation	Life of mine
				Noise impacts should be monitored and kept in accordance with the regulated standard prescribed for the zoning of the area.	As per noise impacts identified	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				The usage of special lighting in the evenings should ideally be investigated in terms of feasibility aiming to limit disturbance of animals (especially many SCC animals are deemed nocturnal) and the attraction of insects to these lights that often lead to their death. The current use of high-power security lighting for public areas and domains have a devastating effect on the nocturnal animals and insects by attracting them away from their natural environment, leading to certain death. A Mercury arc and halogen lamps emit light in the white spectrum, disorientating nocturnal insects and animals and in turn prevents mating and depletes the natural environment of many species as they die circling the lights. Yellow Sodium lights are prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife and the more natural areas. Sodium lamps require a third less energy. Potentially shades can be place over lights to redirect light down.	As per visual impacts identified	Life of mine
				Prevent impacts and waste from reaching the various drainage areas and areas outside the dirty footprint areas. Waste that is not managed correctly may enter the environment or contaminate the river systems and therefore the aquatic ecosystems during a rain event. This should be prevented by storing hazardous wastes in bunded areas and ensuring the TSF and WRD complies with the specific liners required to prevent leaching into the environment.	Norms and standards for waste management activities as promulgated in terms of NEMWA	Life of mine
				Strict rules should be adhered to offenders entering the natural environment outside of the footprint.	N/A	Life of mine
WRD Expansion	1,85 Ha expansion area	Fauna	Co, Op	The construction area should be well demarcated and construction workers should not enter adjacent areas;	Comply with Requirements of the EMPr	Life of mine
				Any nests encountered should be avoided as much as possible.	N/A	Life of mine
				To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors’ employees.	Permits for relocation in place	Life of mine
				Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.	Pre-impact vegetation	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
WRD Expansion	1,85 Ha expansion area	Fauna	Co, Op	Implement all other mitigation measures prescribed and manage the expansion as per current WRD area to prevent any new impacts stemming from the expansion	Comply with Requirements of the EMPr	Life of mine
WRD Expansion	1,85 Ha prevent area	Fauna	Op	Enclosing and containment of the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a controlled environment.	Comply with Requirements of the EMPr	Life of mine
				Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase are speedily managed and restored. This includes erosion and the management of Invasive plant species.	Pre-impact vegetation	Life of mine
				Noise impacts should be monitored and kept in accordance with the regulated standard prescribed for the zoning of the area.	As per Noise impacts identified	Life of mine
				Strict rules punishment should be adhered to offenders entering the natural environment outside of the footprint.	N/A	Life of mine
				Implement all the EMPr requirements as prescribed for the WRD footprint area (since this is only an extension).	Comply with Requirements of the EMPr	Life of mine
Site clearance for WRD expansion and TSF development	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Air quality	Co	Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere. Should any fine materials (e.g. product) be transported it is recommended that it be covered with a tarp.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
				Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur.	N/A	Life of mine
				Topsoil should be re-vegetated to reduce exposure areas.	N/A	As needed
				During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised.	N/A	Continually
				Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads.	N/A	As needed
				When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads.	N/A	Continually
				Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form.	N/A	Continually
				Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect.	N/A	As needed

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Any crusting of the surface binds the erodible material.	N/A	As needed
				All stockpiles to be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation).	N/A	As needed
				Successful trialling of broad acre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop, providing an established vegetative stabilisation to minimise the potential for windblown dust generation.	N/A	As needed
				Constricting the areas and time of exposure of pre-strip clearing in advance of mining development.	N/A	Life of mine
Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, drilling, drilling blasting, etc.)	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Air quality	Co	Dust emitted during bulldozing activity can be reduced by increasing soil dampness by watering the material being removed thus increasing the moisture content. The potential use of dust collected and filters on drill rigs should be investigated.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
				Another option would be to time the blasting with wind to ensure the dust will not be blown to the sensitive receptors or especially the community.	Good practises	As needed
				Blasting should also not take place when poor atmospheric dispersion is expected i.e. early morning and late evening.	Good practises	Continually
				Material need to be removed to dedicated stockpiles to be used during rehabilitation.	Compliance with EMPr	Continually
				This hauling of materials should take place on roads which is being watered and/or sprayed with dust suppressant.	Good practises	Continually
				To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	Good practises	As needed
				Constricting the areas and time of exposure of pre-strip clearing in advance of construction to limit exposed soil surfaces.	Compliance with EMPr	Life of mine
General transportation, hauling and vehicle movement on site	Whole site	Air quality	Co	Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	As per Air quality impacts identified	As needed
				Management should fit roads with speed humps to ensure adherence.	N/A	As needed
				Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.	As above	As needed
				The drop heights should be minimised when depositing materials to the ground.	As above	Continually
				Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily.	N/A	Continually
Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Air quality	Op	Refer to Construction phase measures.	Refer to Construction phase measures.	Refer to Construction phase measures.
New TSF, WRD Expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Flora	Cl, Post Cl	A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
				Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase.	N/A	Life of mine
				Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied.	N/A	Life of mine
				Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary. A report should be written and stored and should be available at all times.	Pre-impact vegetation	Life of mine
New TSF, WRD Expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Fauna	Cl, Post Cl	Positive impacts will start outweighing any negative impacts after initial rehabilitation and re-vegetation has occurred. Rehabilitation is a long-term process and the success will be a	N/A	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
	WRD Expansion 1,85 Ha			product of the planning and adherence to the designed final landform and measures initiated to ensure success.		
				Active rehabilitation of degraded landscapes should commence.	N/A	Life of mine
				To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	As above	Life of mine
				Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas.	N/A	Life of mine
				When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas.	N/A	Life of mine
				Impacts will begin to subside and move towards a positive scale (ideally).	N/A	Life of mine
Demolition and removal of all infrastructures including transportation of site	Whole site	Air Quality	Cl, Post Cl	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase.	Good practises	Life of mine
				The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
				Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	As needed
				Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Continually
				Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	N/A	Continually
				Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust.		Life of mine
				Dust suppression of roads being used during rehabilitation should be enforced.	N/A	Life of mine
Rehabilitation (Spreading of soil, re-vegetation and profiling / contouring)	Whole site	Air quality	Cl, Post Cl	Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option.	N/A	Life of mine
				Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion.	N/A	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings.	N/A	Life of mine
				The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
				Spreading of soil must be performed on less windy days.	N/A	Life of mine
				The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation.	N/A	Life of mine
				Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels.	N/A	Life of mine
				Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks.	N/A	Life of mine
				The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall.	N/A	Life of mine
				Speed restrictions should be imposed and enforced.	N/A	Life of mine
				Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	Life of mine
				Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Life of mine
				Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	N/A	Life of mine
				Hard surfaced haul roads or standing areas to be washed down and swept to remove accumulated dust.	N/A	Life of mine
				Dust suppression of roads being used during rehabilitation should be enforced.	N/A	Life of mine
				It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion.	N/A	Life of mine
				These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.	N/A	Life of mine
Operation of the new TSF and WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Noise	Op	No mitigation is required due to low significance of the impact.	As per Noise impacts identified	Not Applicable

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Storm water management for the new TSF and associated infrastructure	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Surface water	Op, Cl, Post Cl	Complete design for storm water management before construction commence. Obtain a water use licence for the storm water management infrastructure. Keep the dirty storm water catchment area as small as possible for the infrastructure to be constructed. Ensure that the design of the storm water infrastructure complies with GN704 and other standards as required.	N/A	Planning to be done before commencement of activity Licenses to be obtained before commencement
Storm water management for the new TSF and associated infrastructure	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Surface water	Op, Cl, Post Cl	The design of the storm water infrastructure will be compliant with GN704 and will be able to capture the 1:50 year rainfall event. The water levels in the dam will be regulated to ensure that it is operated at the lowest water level possible to ensure that there is always capacity available to capture the 1:50 year rainfall event.	Promulgated regulations	Planning to be done before commencement of activity Licenses to be obtained before commencement
Construction of the new TSF and the WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Noise	Co	No mitigation is required due to low significance of the impact.	N/A	N/A
Construction of the New TSF, TSF reclamation and WRD Expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Soils	Co	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed. Construction workers may not create new stockpiles without confirming that the location is correct. Constriction workers may not walk, drive or store any equipment or material on the stockpile area other than the approved material for stockpiling.	Compliance with EMPr recommendations and management measures	Life of mine
				The following recommendations are made with regards to soil stripping:		
				Strip the topsoil (where available) to depth of 50 to 60cm and stockpile at the closest allocated area for the stockpiles	N/A	As needed
				Use the latest freshly disturbed soils as rehabilitation material immediately on the area to be rehabilitated. In that way the effect of long fallow syndrome (loss of soil microbial activity and organic carbon) is negated	N/A	Continually
				The top soils must not be stockpiled higher than 6m (depending on texture) to alleviate natural compaction and the creation of anaerobic conditions in the topsoil.	N/A	Continually

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				The sub-soil can be stripped to a depth above the solid, unconsolidated material (calcrete layer), or weathered saprolite material. The sub-soil must be stripped and stockpiled separately from the top-soil.	N/A	Continually
				All stockpiles should also be protected to prevent erosion of stockpiled material and deflect water runoff. The duration of the stockpiles phase should be limited to a minimum period of time. Stockpiles should not exceed a maximum height of 6 m and it is recommended that the side slopes (should be stable at 1:3 gradient) and surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active. The top fertile 30-60 cm (if available) soil layer should be stockpiled separately and should be used for seeding and revegetation purposes. Site all soil stockpiles upslope from any mining / development activities.	N/A	Continually
				Erosion must be controlled in run-off areas especially in specific positions where donga erosion is present. During all new development care should be taken not to enhance erosion and it should be controlled as soon as erosion is observed. Surface areas should not be left bare for extended periods of time, but should always be vegetated or covered with suitable coverage to prevent dust formation.	N/A	Continually
				Traffic on unpaved roads should be limited, especially regarding heavy vehicles, but especially in erosion sensitive areas. Periods of rain, especially heavy rain, may cause erosion on roads in areas susceptible to erosion. Where erosion trenches are caused due to activities on unpaved roads the trenches should be rehabilitated.	N/A	Continually
				Berms should be constructed if necessary, to prevent storm water, contamination by dirty water and erosion, especially in the areas of the planned tailing dam sites.	N/A	Continually
				All land disturbed by the development should be vegetated and left in the condition it was before the construction or disturbance. None of the disturbed areas should be left uncovered to prevent erosion and soil deterioration.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
				Water runoff must be controlled on the entire site to prevent any further disturbance of the site. Early management to prevent water runoff is needed. Special attention should be given to the entire TWF 1 combined site in terms of surface water management and remediation.	As per surface water impacts identified	As per surface water impacts identified

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				It is recommended to restrict the number of roads, and limit the number of passes on the roads in construction areas to control the possibility of compaction by heavy vehicles and erosion, If necessary, special measurements should be taken to control dust, especially on unpaved roads.	As per Air quality impacts identified	As per Air quality impacts identified
				Seepage may occur in the new development areas and should be controlled as soon as it is observed. High priority should be given to this possible problem. As far as possible topsoil stockpiles should be used within 1 year.	As per groundwater impacts identified	As per groundwater impacts identified
				Contamination of presently undisturbed top soils should be prevented as far as possible. Since large areas on this site have already been disturbed all waste products should be dumped on previously disturbed sites of the prospecting rights areas, even though the soils on this site are of low potential.	As per groundwater impacts identified	As per groundwater impacts identified
Ineffective housekeeping and management of stockpiles and exposed soils as a result of TSF construction, TSF reclamation and WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Soils	All phases	As above.	Compliance with EMPr recommendations and management measures	Life of mine
Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Whole site	Soils	Pl, Co, Op, Cl	As above.	Compliance with EMPr recommendations and management measures	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Stripping of soils, Clearing of vegetation and stockpiling of materials as a result of TSF construction, TSF reclamation and WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Land capability and land use	Pl, Co, Op	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed.	Compliance with EMPr recommendations and management measures	Life of mine
				The recommendations with regards to soil stripping as above is applicable.:	As above	As above
Continued clearing, disturbance, laydown, stockpiling and transportation as a result of TSF construction, TSF reclamation and WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Land capability and land use	All phases	As above.	Compliance with EMPr recommendations and management measures	Life of mine
Access road and stream diversion construction activities	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Soils	Co	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed.	Compliance with EMPr recommendations and management measures	Life of mine
				The recommendations regarding soil stripping are the same as above.	As above	As above
Ineffective housekeepin g and management of stockpiles and exposed	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Soils	All phases	As above	Compliance with EMPr recommendations and management measures	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
soils as a result of the Access road and stream diversion						
Continued activities inclusive of mining and transportation as a result of the access road and stream diversion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Soils	All phases	As above	Compliance with EMPr recommendations and management measures	Life of mine
Stripping of soils, clearing of vegetation and stockpiling of materials for road and river diversion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Land capability and land use	Pl, Co, Op	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed.	Compliance with EMPr recommendations and management measures	Life of mine
				The recommendations regarding soil stripping are the same as above.	As above	As above
Continued clearing, disturbance, lay down, stockpiling and transportation for road and river diversion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Land capability and land use	All phases	As above	Compliance with EMPr recommendations and management measures	Life of mine
Vegetation removal	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Surface water	Co	Finalise design and site layout plan before construction commence.	Compliance with EMPr recommendations and management measures	Life of mine
				Delineate area to be cleared using suitable material	N/A	Before construction commence

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Commence and finalise vegetation clearance during the dry season.	N/A	As needed
				Construct storm water management infrastructure as soon as possible before bigger area is cleared of vegetation to allow for any run-off to be captured in the dirty storm water containment facilities before clearance of TSF area begins.	N/A	Before operation of TSF commence
Vegetation removal	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Surface water	Co	No vehicles to overnight at the construction area.	Compliance with EMPr recommendations and management measures	Life of mine
				Machinery to overnight in dedicated area near workshop.	N/A	Life of mine
				Clear any spills as soon as possible by removing the affected soils and disposing to suitable hazardous waste bin for removal by appointed waste contractor.	N/A	As needed
Diversion of the unnamed tributary around the new TSF and associated infrastructure	River diversion: 2,15 Ha	Surface water	Op	Design the diversion infrastructure before commencement of activity.	Compliance with EMPr recommendations and management measures. Ensure that licences are in place for water use activities.	Life of mine
				Obtain Water use licence for the proposed diversion before commencement of activity.	As per licence conditions	Before construction commence
				Delineate diversion clearly and keep construction to the approved footprint area.	As per licence conditions	Before construction commence
				Construct diversion channel in the dry season.	As per licence conditions	Once off
				Seed the constructed banks with indigenous seed mix and wet as needed to ensure vegetation growth. Assess successful vegetation establishment 3 months after first seeding and re-seed areas with poor vegetation establishment.	As per identified fauna and flora impacts	As per identified fauna and flora impacts
				Conduct annual inspections on vegetation establishment and bank stability of the diversion. Implement rehabilitation measures as needed to ensure that banks do not erode and result in siltation of the watercourse.	As per identified fauna and flora impacts	As per identified fauna and flora impacts
Diversion of the unnamed tributary	River diversion: 2,15 Ha	Surface water	Co	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
around the new TSF and associated infrastructure					and management measures	
Storm water management for the new TSF and associated infrastructure	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Surface water	Co	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Construction of the TSF and associated infrastructure liner system	TSF: 22,3 Ha RWD: 1,74 Ha	Surface water	Co	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Operation of the TSF and associated infrastructure	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Surface water	Op	Complete the design for the TSF before construction commence. Design of the TSF and liner system will be approved by the DWS before commencement of construction. Liner system to be constructed under the supervision of an Engineer. Ensure that there are upstream and downstream monitoring boreholes available to monitor potential leachate from the TSF.	Compliance with EMPr recommendations and management measures	Life of mine
Operation of the TSF and associated infrastructure	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Surface water	Op	Inspect the pipeline on a daily basis and repair any areas immediately. Remove any spilled material immediately and dispose to the TSF.	Compliance with EMPr recommendations and management measures	Life of mine
Operation of the TSF and associated infrastructure	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Surface water	Op	Comply with the operational guideline for tailings deposition to ensure that dam wall integrity is not compromised.	Comply with the operational guideline for tailings deposition to ensure that dam wall integrity is not compromised.	Life of mine
Backfilling of the historic pit area with Tailings	Old pit: 4,48 Ha	Surface water	Op	Ensure that the are upstream and downstream monitoring boreholes available to quantity the impact from the backfilling of the pit with tailings.	Resource water quality objectives as set by the DWS and compliance with	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
					licence requirements	
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Surface water	Cl, Post Cl	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
				Implement the approved rehabilitation plan. It is recommended that the rehabilitated TSF be inspected annually for at least 5 years post closure to identify any problems. Should any problems be identified, amend rehabilitation plan to address the areas and implement.	As per Closure plan	After closure
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Surface water	Cl	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Surface water	Cl, Post Cl	Monitor the upstream and downstream monitoring boreholes for at least 5 years post closure to quantity the impact and update the geohydrological model.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Re-mining of TSF facilities	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Surface water	Op	Inspect the pipeline on a daily basis and repair any areas immediately.	Compliance with EMPr recommendations and management measures	Life of mine
				Remove any spilled material immediately and dispose to the TSF.	N/A	As needed
Re-mining of TSF facilities	New TSF: 22,3 Ha Existing TSFs (1	Surface water	Op	Keep at least 0.5 m of tailings above the liner system to prevent damaging the liner system.	Resource water quality objectives as set by the DWS and compliance with	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
	and 2): 17,61 Ha				licence requirements	
				Use hydro-mining methods and not mechanical methods to reduce the possibility of damaging the liner system.	N/A	Life of mine
				Monitor upstream and downstream boreholes.	As per groundwater impacts identified	As per groundwater impacts identified
Construction of the new TSF and the WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Visual	Co	The visual impact can be minimized creating visual barriers.	Compliance with EMPr recommendations and management measures	Life of mine
				The construction area will be cleared as soon as construction of the infrastructure is finished.	N/A	Life of mine
Permanent nature of the new TSF and WRD expansion	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha WRD Expansion 1,85 Ha	Visual	Op, Cl, Post Cl	The visual impact can be minimized by the creation of visual barriers.	Compliance with EMPr recommendations and management measures	Life of mine
				Planting indigenous vegetation.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
				Clearing only vegetation as required.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
				Rehabilitating any disturbed areas as soon as possible.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
New TSF (TWF1 or TWF3 options)	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Ground-water	Cl, Post Cl	The TSF should be lined with the appropriate liner material as dictated by the waste classification of the tailing's material.	Compliance with EMPr recommendations and management measures	Life of mine
				A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the TSF is diverted clear of the deposit	As per surface water impacts identified	As per surface water impacts identified
Existing TSF	1 and 2: 17,61 Ha	Ground-water	Cl, Post Cl	An extended hydrocensus (2 km radius) must be conducted every 5 years in the area that could be impacted, to update the groundwater status and to provide proof that the mine does not impact on the groundwater.	Resource water quality objectives as set by the DWS and compliance with	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
					licence requirements	
				Monitor groundwater users that could be affected an on annual basis (minimum) to establish a baseline against which impacts can be compared and to protect the mine against unwarranted claims.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
				Water in the Dwars River must be monitored on a monthly basis upstream and downstream of the mining area.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
				Groundwater model must be updated on a 5-yearly interval to incorporate latest groundwater measurements and future mining plans.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
				Additional groundwater monitoring boreholes (sited using geophysical methods and supervised by qualified hydrogeologist) should be drilled and added to current monitoring network before the proposed TWF1 or TWF3, extension of the waste rock dump and planned underground is operational. These should be monitored on a monthly basis prior to construction, during and operational for the identified parameters.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
				The aquifer parameters should be measured by conducting an aquifer test (pump test, slug test etc.) on each of the newly drilled boreholes. 24-Hour pumping tests are recommended. This information can be used to update the numerical with accurately measured parameters	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
				General groundwater management as prescribed for all phase of the mine development.	EMPr compliance	Life of mine
WRD	Existing and expansion: 9 Ha	Ground-water	Cl, Post Cl	As above	Resource water quality objectives as set by the DWS and compliance with	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
					licence requirements	
Underground Mine - planned, inclusive of surface facilities	Whole site	Ground-water	Cl, Post Cl	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground mine - Existing	Whole site	Ground-water	Cl, Post Cl	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground Mine - planned	Whole site	Ground-water	Op	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground mine - Existing	Whole site	Ground-water	Op	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Cumulative of all activities	Whole site	Ground-water	Op, Post Cl	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
TWF1 option	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Archaeo-logical	Op	Conduct detailed mapping of the TWF1 area and the related erosion donga in order to determine the extent of the archaeological deposit and sites located here. Collect samples / excavation of surface features of material dating to the Stone Age and Iron Age once approval is received from SAHRA.	SANS Permit	Before construction begins
Movement of trucks, excavators and other	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Socio Economic	Op	Measures such as ensuring all vehicles and equipment are in good working order, and that any faulty exhaust- and/or intake silencers are replaced timorously, will reduce the severity and significance of the impact.	As per Noise impacts identified	As per Noise impacts identified

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
mining equipment.				Drilling and blasting is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. A complete blasting schedule and timeframes must be compiled and communicated with the adjacent communities to ensure that they are notified in advance prior to blasting taking place	SANS Blasting	Right before and during blasting
				Personnel working within the plant must wear ear protection gear. Operators must wear ear protection at all times when operating the earth moving equipment and machinery to prevent noise induced hearing loss.	Mine Health and Safety standards	Life of mine
				Noise pollution must be monitored monthly, and recorded throughout the life of mine.	As per Noise impacts identified	As per Noise impacts identified
Cumulative of all activities	Whole site	Socio Economic	All	As above	As above	As above
Movement of trucks, excavators and other mining equipment, including mining activities	Whole site	Socio Economic	All	Wetting of the access roads with water periodically to suppress the dust will greatly reduce the impact of dust. This wetting with water must be done daily during dry and windy seasons.	As per Air quality impacts identified	As per Air quality impacts identified
				Dust and smoke monitoring will be conducted during the life of mine to determine the prominent wind directions and dust / smoke levels at various points around the mining site.	As per Air quality impacts identified	As per Air quality impacts identified
				In term of the requirements of the Mine Health and Safety Act, 1996 SECM must provide protective clothing and equipment for all its employees, and must periodically conduct risk assessments to analyse and monitor the effects of dust and smoke on the staff members and the surrounding environment.	Mine Health and Safety standards	Life of mine
				Concurrent rehabilitation and re-vegetation of the project sites will also reduce surfaces that are exposed to wind generated dust.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
All	Whole site	Socio-Economic	All	As above	As above	As above
All	Whole site	Socio Economic	All	Concurrent rehabilitation should be implemented throughout the life of the mine to minimize and return the environment to - as much as possible – the original status. Screening with vegetation (trees) should also be implemented to mask the mine and the other mine infrastructure from various settlement viewpoints and soften the visual impacts.	As per Ecological and Visual impacts identified	As per Ecological and Visual impacts identified
				The visual impact of the Tweefontein opencast pits, residue dumps and surface infrastructure sites can be reduced by	As per visual impacts identified	As per visual impacts identified

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				doing the following: § Filling up the mining site to match the surrounding landscape as closely as possible in the final phase of rehabilitation; § Planting trees on the available fill material at a high density in the first phase of rehabilitation to match the “texture” of the surrounding landscape; § Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e.. grey vs reddish brown).		
				To reduce the impact of the cutting on the topography and restore the landscape character to closely resemble the conditions prior to the opencast pits, the following is recommended: § Studying the contour map of the site and mimicking the surrounding areas on the final earthworks plan as closely as possible without excessive cost as part of the final phase of rehabilitation; § Stabilising the substrate/backfill material by means of a variety of metal-tolerant grasses, shrubs and trees; § Screening the road as far as possible with indigenous trees, grasses and shrubs.	As per visual impacts identified	As per visual impacts identified
All	Whole site	Socio Economic	All	As above	As above	As above
All	Whole site	Socio Economic	All	Rehabilitate the land to as close as possible to its wilderness and grazing land state during and after the mining activities are concluded. Re-vegetation should be with indigenous plant species that are able to sustain the regional climate and soil conditions.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
				The farm where the current mining activities are taking place, is already a restricted/controlled access, therefore the larger SECM Tweefontein mining proposed activities will not reduce availability of natural resources and land to local communities.	N/A	N/A
All	Whole site	Socio Economic	All	As above	As above	As above
TSF and WRD development	TSF: 22,3 Ha RWD: 1,74 Ha River diversion: 2,15 Ha	Socio Economic	Co, Op	All Archaeological, palaeontological and heritage sites and resources must be preserved if they are of cultural, historic or pre-historic significance. This must be done in conjunction with an expert or competent person.	Applicable permits in place if needed	As per Heritage assessment findings
				Monitoring for chance finds (e.g. burial sites, old waste disposal sites, ruins, foundations etc.) must be done	N/A	As needed

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				continuously during operations. If any old graves are encountered, these must be demarcated, documented and fenced-off if preservation is the option taken. However, if preservation is not feasible, the identified graves must be relocated to another suitable site. Thus must be done by an accredited archaeologist through a Section 36 SAHRA permit application.		
				Findings, if encountered during mining activities, must be reported to the LIHRA Office, Limpopo and Fetakgomo Tubatse Municipality who will decide, after consultation with other relevant authorities, company representatives and local communities whether work may go ahead. Special precautions may be instituted to enable the mining work to proceed.	N/A	As needed
				Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist.	N/A	As needed
				Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in order to verify the presence or absence of any such material.	N/A	As needed
				Any graves in the vicinity of the mining operations will or not be directly affected must be documented and monitored for damage.	N/A	As needed
All		Socio Economic	All	As above	As above	As above
All	Whole site	Socio Economic	All	Labour should be sort from the local settlement areas to prevent influx of foreigners who are likely to disrupt the social fabric, values and norms of the village people.	None Applicable	Continually
				Through the SLP and day-to-day training and awareness programmes pandemics such as HIV can be managed and minimized. The Tweefontein mine must also have an HIV awareness outreach programme in conjunction with local health centres and clinics to extend awareness and knowledge about the disease to the broader communities affected by the proposed mine activities.	Existing policies	Life of mine

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Visible policing and community policing forums must be established to curb incidents of crime in the communities. This option must be implemented in conjunction with existing tribal authority processes to manage crime and illegal activities.	N/A	Life of mine
All	Whole site	Socio Economic	All	As Above	As Above	As Above
All	Whole site	Socio Economic	All	Promotion of chrome beneficiation within the Limpopo to improve the quality and value of the product being mined, and create further economic activity. Samancor Chrome Limited already has chrome concentrator plants in the Steelpoort valley. Subject to economic modelling and feasibility study, another concentrator plant in the vicinity of Tweefontein can further stimulate significantly the economic activity in Fetakgomo Municipality, Lebowakgomo and the surrounding region.	As Above	As Above
				Labour should be sort from the local settlement areas to prevent influx of foreign people and job seekers who are likely to disrupt the social fabric, values and norms of the village people.	Existing policies	Life of mine
All	Whole site	Socio Economic	All	As Above	As Above	As Above
All	Whole site	Socio Economic	All	As Above	As Above	As Above
TSF Operation	New TSF: 22,3 Ha	Socio Economic	Op	As per TSF failure under Surface water	As per TSF failure under Surface water	As per TSF failure under Surface water
Opencast mining and Underground mining areas	Whole site	Geology	Op	No mitigation is possible as there is no way that the resource could be replaced	N/A	Duration of mining
Opencast mining areas	Whole site	Topo-graphy	Op	Backfill voids	N/A	When mining is finished
				Rehabilitate disturbances caused by geological exploration	N/A	Immediately
				Level trenches and boreholes and cover with topsoil	N/A	When not in use any more
				Seed and vegetate area disturbed by exploration	N/A	Immediately
				Should erosion occur suitable alternatives such as mulching and shelter beds for wind erosions should be investigated	N/A	Immediately
All	Whole site	Topo-graphy	Op	The hard and soft material placed in mined out areas must be profiled in keeping with the adjacent un-mined areas	N/A	When mining is finished
				At the contact between the pit and the un-mined land the slope of the ground must not exceed 5%	N/A	When mining is finished

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Shape the topography so that it is free draining and reshape areas of arable land capability so that it does not have a slope greater than 4%.	N/A	When mining is finished
				Replace topsoil to achieve required pre-mining land capability	N/A	When mining is finished
				Re-vegetate rehabilitated areas	N/A	Immediately
All	Whole site	Soils	Op	Strip all usable soil ahead of mining and related activities. This should comprise the entire A-horizon and the majority of the B-horizon material, until 10 percent (10 %) mottling is evident in sub-soils. Soil should be stripped during low rainfall conditions.	N/A	Before construction start
				Within the footprint of the opencast area, extra care will need to be taken to recover all usable topsoil; Topsoil must be stripped from the cleared sites as for undisturbed areas.	N/A	Before construction start
				Where possible replace stripped soil directly in mined out areas where profiling and final shaping have been completed.	N/A	During rehabilitation
				Where soil must be stockpiled, site the topsoil stockpiles up slope or next to, but not down slope of, the mining operation so as to minimise the risk of topsoil contamination.	N/A	Continuous
				All topsoil stockpiles to be protected from erosion by a development of an earth deflection bund upslope of the stockpile.	N/A	Continuous
				If soil stockpiles are going to be left for more than 12 months, vegetate soil stockpiles to minimise soil loss to wind and water erosion. Vegetation to comprise seeding with commercially available pasture grasses.	N/A	Continuous
				Construct surface water control berms on the contour to manage storm water runoff onto rehabilitated sites until such time as the re-established vegetation community has stabilised.	N/A	During rehabilitation
				Establish surface water control berms along the contour on rehabilitated land to control the flow of surface water across rehabilitated land.	N/A	During rehabilitation
				Re-establish drainage lines at a drainage density equal to or greater than the pre-mining drainage density.	N/A	During rehabilitation
				Re-vegetate placed topsoil areas as soon as possible after placement in order to minimise soil loss to wind and water erosion	N/A	Continuous
All	Whole site	Soils	Op	Where possible, place stripped topsoil directly onto profiled and shaped areas to minimise the volume of soil that needs to be stockpiled.	N/A	During rehabilitation

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Prior to planting or seeding, conduct routine fertility analysis and fertilise accordingly to create growing conditions that are suitable for plant growth.	N/A	Continuous
All	Whole site	Soils	Op	Clean affected area immediately and place contaminated soil in special bin.	N/A	Immediately
				Service vehicles regularly and keep vehicles in a dedicated area when not in use.	N/A	Continuous
				Place drip trays under vehicles and remove contaminated material to an approved waste landfill site.	N/A	Continuous
All	Whole site	Land capability	Op	Reinstate land capability classes with the exception of the area where shallow soils depths occur resulting in classification of the area as having a wilderness land capability. These areas to be returned to wilderness land capability by return of more than 300 mm soil to the profiled spoils.	Compliance with Closure plan	During rehabilitation
				Re-establish surface drainage and a free draining landform	Compliance with Closure plan	During rehabilitation
				Implement soil protection and conditioning measures	Compliance with Closure plan	Continuous
				ECM to conduct monitoring of rehabilitated areas to assess performance of the rehabilitation approach employed. Rehabilitated areas should be monitored annually to identify: (1) occurrence of surface erosion, (2) vegetation die back, (3) salinization of the soil surface, (4) fertility status of rehabilitated land, (5) the emergence of alien/exotic vegetation	N/A	Annually
				In the event that non-performance is identified, the ECO will implement a plan for corrective action, and will seek the advice of rehabilitation ecologists as required	N/A	As needed
All	Whole site	Land use	Op, Cl	Make rehabilitated land areas of wilderness potential available for controlled use as soon as possible in order to facilitate the reintegration of these areas into the regional framework.	N/A	As soon as possible
Opencast mining and Underground mining areas	Will depend on current operational activities in a phased approach	Land use	Op	The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated.	N/A	Continuous
				Burning of fire breaks around veld areas should be carried out in agreement with neighbouring communities or land owners and permits to burn obtained prior to undertaking activity	N/A	When needed

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
All	Whole site	Natural vegetation / plant life	Op	Avoid areas where rare plant species occur	EMPr compliance	Continuous
				Relocate rare plant species when needed, e.g. aloes, succulents and woody species	Permits for relocation in place	When needed
All	Whole site	Natural vegetation / plant life	Op	Inspect all land areas under ECM control annually, at the start of the summer period.	N/A	Annually
				Map areas of exotic vegetation, should such vegetation develop on the areas of the site outside of the mine pit footprint. Classify areas of infestation as areas of heavy, medium or light infestation. Define the perimeters of these areas and manage as follows: (1) Fix the perimeter of each area. (2) Actively eradicate any new exotic vegetation outside of the heavily infested areas. (3) Starting with the areas of light infestation, actively eradicate the exotic vegetation from within the identified areas.	N/A	Annually
				Maintain an active follow up programme in cleared areas to control re-growth and seedling establishment and thereby prevent re-infestation of the cleared areas.	N/A	Annually
				Keep rehabilitated land clear of alien vegetation through regular inspection and clearing of young plants.	N/A	Annually
All	Whole site	Natural vegetation / plant life	Op	To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining.	N/A	When area becomes available for rehabilitation
				Preparation of rehabilitated land areas for revegetation.	N/A	When area becomes available for rehabilitation
				Sow the prepared areas with a seed mixture which will produce a grass cover at various levels and over as much of the growing season as possible. The seed mix should consists of the following: (1) Eragrostis tef (teff) 1 - 2 kg/ha (2) Medicago sative (Lucerne) 1 - 2 kg/ha (3) Cynodon dactylon (couch grass) 2 - 4 kg/ha (4) Chloris gayana (Rhodes grass) 4 - 6 kg/ha (5) Digitaria eriantha (Smuts finger grass) 4 - 6 kg/ha.	N/A	When area becomes available for rehabilitation
				Include other native grass seed in the mixture applied when such seed is available.	N/A	When area becomes available for rehabilitation
				Include successive rehabilitated areas of the Tweefontein opencast into an annual land monitoring programme.	N/A	Annually
				Appoint an ecologist to carry out vegetation monitoring at regular intervals (two years) within each area that has been	N/A	Every 2 years

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				re-vegetated to establish the progression towards self-sustainability in re-vegetated areas.		
				Monitoring should include assessment of the following: (1) species abundance and basal cover (2) an estimation of biomass yield (3) index of plant species diversity within the rehabilitated plant community.	N/A	Every 2 years
All	Whole site	Animals / Fauna	Op	Manage the development of the mining window in such a manner that the footprint of disturbance is minimised. This will include the maintenance of natural corridors to allow for the movement of animals.	N/A	Continuous
				Do not allow hunting or trapping of game or birds on the site.	N/A	Continuous
				Ensure that environmental education of mine staff takes place at all levels to limit unnecessary damage to habitats and/or disturbance of fauna. Develop environmental module to form part of site induction programme. All contractors and staff to attend induction.	N/A	Continuous
All	Whole site	Surface water	Op	Seal against the loss of water from the beds of the river	N/A	Continuous
				Develop a mining layout with sufficient walls to prevent subsidence	N/A	Continuous
				Should ingress occur, collect seepage in the highest mining level and pump out as soon as possible	N/A	When needed
				If the water collected is contaminated implement treatment measures before release	N/A	When needed
				Return post mining topography to as close as possible to pre-mining situation	N/A	During rehabilitation
				Return the surface water drainage pattern to as close as possible to pre-mining situation	N/A	During rehabilitation
				Design culverts and bridges so that the flood times and water retention times do not impact on mining infrastructure	N/A	Continuous
				Implement storm water management to divert clean water around the mining area to ensure that the dirty footprint is kept to a minimum	N/A	Continuous
				Contain all contaminated water in a dedicated design facility to adhere to legislation and to contain a 1:50 year storm event and have a 0.8m freeboard	N/A	Continuous
				Ensure that all hazardous substances (Oils etc.) are stored in an appropriate facility (Bund walls / roofs)	Good practises Municipal bylaws	Continuous
				Implement a rehabilitation strategy for the stream diversions at Klarinet	N/A	During rehabilitation

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Quantitative and qualitative assessment of the water resources on the mining property to effectively conduct Integrated Water Resource Management	N/A	Continuous
				Optimise water use by means of waste water minimisation, and increasing the reuse and recycling of waste water	N/A	Continuous
				Effective and efficient use of the existing available water resources in all water use sectors within the mine (WCDM)	N/A	Continuous
				Regular maintenance of surface water management infrastructure to be done in order to prevent silt build up	N/A	Continuous
				Update water balance at least twice a year	N/A	Bi-annual
All	Whole site	Surface water	Op	Design and manage all storm water infrastructure to comply with the regulations to prevent discharges from waste water infrastructure during rainfall events	N/A	Continuous
				Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops)	N/A	Continuous
				There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years.	N/A	Continuous
				Re-use water and limit the volume of water stored in waste water dams. The operating protocol is as follows: Process water (including dust suppression) must be obtained from: The Storm water / Return water dam unless it is empty; Water from the opencast (Void 2) unless it is empty; Water for domestic purposes will be obtained from the registered boreholes. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs.	N/A	Continuous
				Avoid contamination of soils and implement appropriate remedial measures if incidents of spillage occur as well as responsible waste management practices. Implement all management measures pertaining to waste and water management as set outlined in the IWWMP.	N/A	Continuous
				The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and	N/A	Bi-annual

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall.		
				Operate the storm water / Return water dam to have 0.8 m freeboard	N/A	Continuous
				Implement storm water management before land clearing start at opencast sections	N/A	Before construction start
				Conduct inspection of water infrastructure to detect leaks and replace / repair immediately	N/A	Continuous
				Vehicle will be maintenance	N/A	Continuous
				Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them	N/A	Continuous
				Monitor quantities and qualities of all water that is discharged	N/A	As needed
				Construct river diversion infrastructure during the dry season	N/A	As needed
				Contaminated water will be contained within an isolated dirty water system	N/A	Continuous
				Generation of contaminated water to be reduced as far as possible. All pit water to be pumped to Void 2 on a continuous basis to minimise exposure to waste material	N/A	Continuous
				The storm water diversion trenches will be kept free from obstructions to ensure that their efficiency is not rendered negatively. Storm water control measures will be incorporated with open pit mining progression to enhance the efficiency of the system	N/A	Continuous
				No construction or maintenance of roads, berms or any water management facility will be undertaken with carbonaceous material	N/A	Continuous
				The water pollution control management facilities will be operated in such a way as to ensure that the available capacity and freeboard requirements as depicted in GN 704 are adhere to at all times	N/A	Continuous
				Minimisation and where possible prevention of water pollution stemming from mining activities by compliance with and adherence to management commitments	N/A	Continuous
				Appropriate storm water management over the entire footprint of the project area to ensure reduction in pollution of surface water quality	N/A	Continuous

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Assessment of the cumulative impacts from nearby mines with the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted	N/A	As per the surface water monitoring programme
				Waste water facilities liner systems will be approved by the DWS in line with current applicable legislation	N/A	Continuous
				Monitoring of water resources will be carried out in accordance with an approved monitoring programme	N/A	As per the surface water monitoring programme
				Update salt balance at least twice a year	N/A	Bi-annual
Opencast and Underground mining	Will depend on current operational activities in a phased approach	Surface water	Op	Reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed.	N/A	During rehabilitation
				A 100 m buffer zone be placed alongside the riparian banks of all watercourses and that no additional mining or mining activities should occur within this area.	N/A	Continuous
				The necessary mitigation be put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas.	N/A	Continuous
				Riparian habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic.	N/A	Annually
				SASS5 aquatic invertebrate assessment must be conducted (in conjunction with diatom sampling if available in South Africa) as part of the aquatic monitoring plan for the mine in the Dwars River.	N/A	Bi-annual
				Responsible development in a sensitive environment (drainage line)	N/A	Continuous
				Diversion of drainage lines at Klarinet opencast area and release of diverted water in a responsible manner	N/A	Continuous
				Storm water runoff from roads will be attenuated using energy dissipation to reduce risk of erosion of water courses	N/A	Continuous
				Catch pits and silt traps will be constructed at strategic locations to reduce siltation of the water courses	N/A	Continuous
				Regular maintenance of roads and associated surface water management structures will be undertaken	N/A	Continuous
				Monitoring of water resources will be carried out in accordance with an approved monitoring programme	N/A	As per the surface water monitoring programme

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Mine infrastructure layout to be based on site selection to prevent the construction of pollution control facilities on sensitive areas such as drainage lines	N/A	Continuous
				Surface subsidence of rehabilitated areas and differential settlement will be repaired by backfilling and sloping to prevent ponding and promote free draining	N/A	During rehabilitation
				Construct river diversion infrastructure as needed at the opencast area once approval from Department of Water Affairs is received	N/A	As needed
All	Whole site	Ground-water	Op	Carry out rehabilitation of mined land concurrent with mining.	N/A	Continuous
				Monitor groundwater in boreholes associated with the opencast pits, tailings areas, pollution control dams, WWTW's and those boreholes identified for monitoring in surrounding areas. Where boreholes do not exist, these will need to be drilled in the relevant positions.	N/A	As specified in ground water monitoring plan
				Monitoring of boreholes should be carried out monthly for the first 12 months of operation. Thereafter to reduce the groundwater monitoring program to a quarterly frequency, subject to acceptance of the revised monitoring program by DWS.	N/A	Monthly, then quarterly
				Should the mining operation be shown to be impacting on adjacent groundwater users through a reduction in groundwater yield, level, or deterioration in quality, and such impact be consistent with ground water level results from ECM’s groundwater monitoring program, then affected parties should be provided with an alternative source of water of equal quantity and quality, or should be compensated for such loss by ECM, and as agreed with land owners	N/A	As needed
				Rehabilitate mined areas concurrent with mining advance in order to maximise the recovery of clean water runoff.	N/A	Continuous
				Implement surface water control measures to maximise the return of clean runoff to the Steelpoort and Dwars River system.	N/A	Continuous
				Monitor possibly affected boreholes for water levels and water quality	N/A	As per the groundwater monitoring plan
All	Whole site	Ground-water	Op	Numerical modelling needs to be undertaken to shown what decant will occur once water levels have recovered to pre-mining levels. The actual volume of decant will need to be	N/A	Every 5 years as part of Groundwater situation assessment by Specialist

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				confirmed by monitoring. The volumes are predicted to be small, and the potential for poor water quality is limited.		
				Passive water treatment wetlands will be constructed to treat decant water if any.	N/A	As needed
				Implement active intervention measures in the rehabilitated mining areas to capture the decant through active level control. Each area is to be equipped with a pump controlled by a level switch that will activate the pump when water levels rise to the trigger level.	N/A	As needed
				Refine pump locations for each pit, in consultation with a hydrogeologist, as the floor and lower high wall characteristics are better revealed during mining of each pit. To limit off take of poor quality water that may accumulate in the pit, the pump off take should be positioned off the floor of the pit.	N/A	As needed
				Ensure that mine water pumping infrastructure is repositioned to meet the long term pit water regulation need of each pit, if required when each pit is mined out, and that such pumping infrastructure is keyed into the piping infrastructure to dispose of this water.	N/A	As needed
				Implement water and material management strategies, which would mitigate likely Acid Rock Drainage (ARD) and associated water quality impacts during the operational and closure phase of the mining operations as indicated below.	N/A	Continuous
				Effective water management during the operational life of the mine will prevent unnecessary loss of available alkalinity from waste materials. This means prevention of ponding in mining sections and preventing tunnelled sections from flooding whilst operational. Once mined out, flooding of sections should be encouraged as rapidly as possible and the flooded areas should not be allowed to drain again, in order to minimise wetting and drying cycles which exacerbate geochemical weathering.	N/A	Continuous
				Decant water should be pumped from the highest point if water levels need to be controlled. This will reduce the probability of drawing in oxygenated water towards the base of a water body.	N/A	Continuous
				Preventing percolation of groundwater through spoil materials. This may be practically achieved by mining from low-lying areas to high lying areas. This strategy prevents salts (alkalinity) from being leached out of the material and allows low lying areas to be flooded once they have been mined,	N/A	Continuous

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				thus reducing or preventing oxygen ingress to reactive sulphides. An added advantage of this strategy is that water storage capacity is created in the mined area. It is thus likely that pumping and treatment requirements will be reduced and that long term water qualities will be better. The overall benefit should translate into a reduced pollution load emanating from the workings and a lower probability of acidification.		
				Sample boreholes on a monthly basis for a selected set of elements and constituents and record groundwater levels to establish seasonal trends and changes due to mining, if present.	N/A	Monthly, then quarterly or as per Groundwater monitoring plan
				Set up and maintain a rain gauge on the mine site. Monitor rainfall on a daily basis and capture rainfall data electronically for the full life of the mine and until closure is obtained.	N/A	Daily
				Bi-annually, have groundwater samples analysed for the full set of elements.	N/A	Bi-annual
				Submit results to the DMR and the Department of Water Affairs on an annual basis.	N/A	Annually
				Initiate siting and drilling of two boreholes in rehabilitated pit areas, in consultation with a hydrogeologist. Boreholes to be drilled after completion of rehabilitation. Boreholes to be fully cased to protect against hole collapse in infilled spoils.	N/A	As needed
				Monitoring of the boreholes must continue until water levels and water quality stabilise, or until an alternative commitment is made and agreed with DMR and DWS in the mine closure plan that will be prepared prior to application for closure of the mine.	N/A	As needed
Operation of Tailings facilities	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Ground-water	Op	N/A	N/A	N/A
All	Whole site	Air quality	Op	Implement and maintain a dust suppression system on the opencast haul road and service roads associated with the pits. This includes but is not limited to speed limit implementation.	N/A	Continuous
				Suppress road dust when dust entrainment behind vehicles is noticeable.	N/A	Continuous
				Install dust fall-out buckets at relevant positions.	N/A	Continuous
				Carry out monitoring of respirable dust.	N/A	As per the dust monitoring plan

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Sample dust buckets associated with the pits on a monthly basis and implement corrective action as required.	N/A	Monthly
				Service vehicles regularly.	N/A	Continuous
				Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed. Note as per 2021 amendment, the tailings retreatment contractor is busy with trials that may use mulching for tailings retreatment.	N/A	Continuous
Opencast mining	Will depend on current operational activities in a phased approach	Air quality	Op	This is achieved by emissions quantification of all activities and dispersion modelling; and monitoring of TSP for nuisance dust and health impact purposes respectively	N/A	As per the dust monitoring plan
Processing plans, Stockpiles, opencast and Underground mining	Will depend on current operational activities in a phased approach	Air quality	Op	Implement and maintain a dust suppression system on the opencast haul road and service roads associated with the pits and unpaved roads, this could include speed limit implementation.	N/A	Continuous
Processing plants	18 Ha	Air quality	Op	Suppress road dust when dust entrainment behind vehicles is noticeable.	N/A	Continuous
All	Whole site	Air quality	Op	Install dust fall-out buckets at relevant positions.	N/A	Continuous
All	Whole site	Air quality	Op	Sample dust buckets associated with the pits on a monthly basis and implement corrective action as required.	N/A	Monthly
All	Whole site	Air quality	Op	Service vehicles regularly.	N/A	Continuous
Tailings dams	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Air quality	Op	Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed. Note as per 2021 amendment, the tailings retreatment contractor is busy with trials that may use mulching for tailings retreatment.	N/A	Continuous
Topsoil stockpiles	Will depend on current operational activities in a phased approach	Air quality	Op	Vegetate soil stockpiles	N/A	Continuous
Overburden and waste rock dump	Will depend on current operational activities in a	Air quality	Op	As above	N/A	As above

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
	phased approach					
ROM Stockpiles	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
Opencast mining	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
Opencast mining	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
Processing plants and Opencast mining, stockpile areas	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
Processing plant	18 Ha	Air quality	Op	As above	N/A	As above
All	Whole site	Air quality	Op	As above	N/A	As above
Tailings dams	New TSF: 22,3 Ha Existing TSFs (1 and 2): 17,61 Ha	Air quality	Op	As above	N/A	As above
Topsoil stockpiles	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Overburden and waste rock dump	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
ROM Stockpiles	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
Opencast mining	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
Opencast mining	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
All	Whole site	Air quality	Op	As above	N/A	As above
Underground mining	Will depend on current operational activities in a phased approach	Air quality	Op	As above	N/A	As above
All	Whole site	Noise and Vibration	Op	Construct earth berms before commencement of mining in order to screen the operational noise sources from the receiving public	N/A	As needed before mining start
				Carry out noise monitoring during the operational phase of the mine to ensure that noise mitigation is effective. Appoint independent noise specialist to carry out day time / night time noise monitoring every second year. First assessment to be carried out during first year of operation. Noise specialist to provide ECM with specialist advice on modification of acoustic berms if such berms prove to be ineffective	N/A	Every second year

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Ensure that the area has been made safe in terms of the Mine Health and Safety Act (500 m) that all people and livestock are outside of the blast exclusion zone (500 metres) prior to blasting.	SANS Blasting	Continuous
				Use electronic detonators whenever possible.	SANS Blasting	Continuous
				Develop and implement a blasting programme that defines a window of time when in the day blasting will occur. This has provisionally been planned for 13h00 – 14h00. ECM to obtain signoff from DMR for this blast management plan, specifically the implementation of special measures that may be required when blasting within 500 meters of the villages. It is recommended that the blasting plan include that blasting is to be avoided during overcast conditions.	SANS Blasting	Continuous
				Communicate blasting programme to the public and directly affected landowners (neighbouring farmers, residents of the local village) so that they can anticipate and/identify blasts as being part of the mining operation.	SANS Blasting	Continuous
				Wherever possible, all blasts at the Tweefontein section should involve sequential detonation of charges, rather than simultaneous detonation of all charges in order to reduce both noise and ground shock. The impact of blasting noise on people will not be a problem as there are no people near opencast areas	SANS Blasting	Continuous
Opencast	Will depend on current operational activities in a phased approach	Noise and Vibration	Op	Ensure the 500-metre blast exclusion zone is cleared prior to blasting, alternately as directed by the Department of Mineral Resources in the Mine Health and Safety Act/Occupational Health and safety Act	SANS Blasting	Continuous
				Announce all imminent blasts by means of a blast claxton/siren.	SANS Blasting	Continuous
All	Whole site	Sensitive landscapes	Op	N/A	N/A	N/A
All	Whole site	Visual aspects	Op	Provide screening along the public road in the form of overburden dumps developed alongside roads in order to reduce visual intrusion. No screening will be applied near the Klarinet site due to its topographical nature.	N/A	Continuous
				On completion of mining and successful rehabilitation of the mining area this feature could be removed and the footprint grassed, or it may be left intact, depending on agreement between ECM and the landowner	N/A	During rehabilitation

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed	N/A	Continuous
				Vegetate screening walls	N/A	Continuous
Opencast	Will depend on current operational activities in a phased approach	Archaeo-logical and cultural interest	Op	If archaeological sites identified are going to be impacted on by the mining operations, these sites have to be subjected to a Phase II investigation. A Phase II investigation of these sites would require that the archaeologist obtain a permit from the South African Heritage Resources Agency (SAHRA), which would also allow for the demolishing of the site after it has been subjected to the Phase II investigation. Small excavations may have to be conducted in the site in order to collect material from the site	N/A	Continuous
				Inform all workers of the historical sites.	N/A	Continuous
				Exhume and relocate graveyards that will be impacted by mining activities when needed.	N/A	When needed
All	Whole site	Socio-Economic structure	Op	Even though there is no guarantee of securing employment for the local people from the proposed mining activities, a detailed skills survey for the project area should be undertaken.	N/A	When needed
				There is a need for a clear employment policy that is merit based, gender and race neutral and which offers opportunities for employee advancement.	N/A	Continuous
				Award bursaries to young people in local communities on condition that the bursary holders are available for vacation employment and apprenticeships.	N/A	Continuous
				Select young local people who possess good educational qualifications for apprenticeship positions.	N/A	Continuous
				Emphasise the indirect employment opportunities that will come from local contracting by the mine and from the increased local expenditure by mine employees.	N/A	Continuous
				Establish effective and timeous communication with community leaders.	N/A	Continuous
				Ensure that a transparent procurement process for the mine is adhered to at all times is critical. This should include a database of suppliers available in the areas surrounding the mine, as well as their training and support requirements.	N/A	Continuous
				Implementing an extensive and pro-active HIV/Aids policy and campaign.	N/A	Continuous

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				ECM should make it clear (through advertisement) that no new recruitment will take place and the area should be patrolled to prevent possible squatting	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Fencing around the opencast and underground mines area to be inspected weekly and maintained in competent condition.	N/A	Weekly
				Ensure that signs are erected on all boundary fences warning against entering mining area.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Security: Appropriate steps (e.g. upgrading of current security system) to be taken in consultation with other mines and relevant stakeholders.	N/A	Continuous
				Health: ECM's HIV/AIDS programme should include not only its employees, but also strive to provide community support. HIV/AIDS awareness programmes should be promoted, particularly among adolescents.	N/A	Continuous
				Pressure on existing infrastructure: ECM is to cooperate with GTLM in terms of its IDP to upgrade infrastructure in the area.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	The number of local job opportunities is to be maximised. ECM (Samancor) to continue with current housing initiatives, including promotion of home ownership among employees, facilitation of applications for RDP housing subsidies on behalf of employees, provision of housing loans for employees, abolishment of the hostel system, etc. ECM (Samancor) to continue with infrastructural support to selected schools to meet the needs of employees' children. ECM (Samancor) to continue providing health related services and medical schemes for mineworkers and their families.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	The most direct road haul routes should be selected where possible. ECM to support GTLM in terms of its IDP to upgrade and maintain local roads. ECM to give preference to maintenance of the R37 road, which is the main tar road passing all the affected communities. Upgrading may be undertaken as joint venture with other mines in the area. Contractors to comply with road signs and safety policy.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	ECM is to ensure that existing security fencing and barriers are sufficient to prevent unauthorized access to the premises.	N/A	Continuous
				Educational and information programmes to be implemented at neighbouring schools to advise children on the risk of entering the mine site	N/A	Continuous

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
All	Whole site	Socio-Economic structure	Op	Can be further reduced through management of noisy equipment and light lighting and muted colour schemes.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Sewage: As there are seven sewage plants in the area, no additional sanitation is required. Sewage will not be pumped into the nearby water courses	N/A	Continuous
				Water quality, noise and dust: The impacts on human health and mitigation measures are addressed in the relevant specialist studies.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Preferential targeting of local employment, e.g. use local employment broker/special tendering arrangements	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Local employment to be maximised through training and capacity. Factors currently limiting employability of communities in the Steelpoort area should be addressed in the Social and Labour Plan. A defined percentage of staff should be recruited from the local area. Employment at the mine should be based on the principles of Employment Equity (incl. Mining Charter requirements in terms of women in mining).	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Re-skilling where necessary to insure continued employment of current staff	N/A	
All	Whole site	Socio-Economic structure	Op	Increase efficiency for implementation.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Assist municipality to upgrade physical and social infrastructure.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Refine procedures for implementation	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Direct through Social Investment fund and integrate activities with other industries in the area.	N/A	Continuous
All	Whole site	Socio-Economic structure	Op	Specific issues raised concerning the mine are contained in an independent Issues and Response Report in which comment is provided on each issue raised and, where relevant, a reference is given to indicate where in the	N/A	Continuous

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				approved EIA and EMPr document the issue of concern has been addressed.		
				Provide an on-going means of communication with directly affected parties and ECM.	N/A	Continuous
				A complaints and compliments register should be established and be kept at the mine site office in which any complaint or compliment received is documented, the party responsible for follow-up is indicated and the follow-up actions recorded.	N/A	Continuous
				This register should be kept in an accessible area, probably at the mine administration office front desk.	N/A	Continuous
				The mine manager and ECO must be apprised of any issues raised, within 24 hours of entry into the register. The ECO, in consultation with the mine manager will identify who is responsible to follow up on the issues raised. Contact to be made with the stakeholder within 48 hours of receipt of the issue, and feedback to be provided to the stakeholder that raised the issue, on close out of the issue. The timeframe that will be necessary to address the issue must be communicated during initial contact with the stakeholder.	N/A	Continuous
All	Whole site	Geology	Re, Cl, Post Cl	As above	As above	As above
All	Whole site	Topo-graphy	Re, Cl, Post Cl	On completion of mining , all supporting mine infrastructure will be removed	N/A	During rehabilitation
				Haul roads will have consolidated basement materials lifted and disposed of to pit. Footprint of haul roads will be ripped to a depth of 1.0 meters. Topsoil will be spread over the ripped haul road footprint to a depth of 300 mm and reseeded.	N/A	During rehabilitation
				Pit ramps will be infilled with spoils, profiled to be free draining, top soiled and re-vegetated.	N/A	During rehabilitation
				The on-site vent shaft and explosive silos will be removed from site for re-use. Concrete associated with these will be buried on site in the old workings/spoils of the opencast final void and covered with a minimum of one metre of material (inclusive of topsoil layer).	N/A	During rehabilitation
				Piping and water treatment infrastructure will be maintained on site until water quality monitoring data proves that the water quality is acceptable for direct release to the receiving environment. The detailed closure plan that will be developed will address long term water monitoring and maintenance requirements.	N/A	During rehabilitation

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				The tailings dam is being reclaimed and processed and the residue will be pumped to voids. The voids will be rehabilitated with stockpiled soils and vegetated. If decanting occurs, wetlands will be constructed to be passive water treatment facilities. The original dam will be rebuilt in time and has to be rehabilitated.	N/A	During rehabilitation
				The Tweefontein resource will be mined by opencast and surface mining methods. The overburden material returned to a pit on completion of mining will seal surface mining areas. The high wall line of all rehabilitated pits will be monitored to detect areas of differential settlement of ground following rehabilitation. Should localised cracking or rat holing be identified anywhere along the pit high wall, such areas would be filled in with soil and regressed.	N/A	During rehabilitation
				Inspect the high wall contact line (line of high wall contact with un-mined ground) of all rehabilitated pits annually to identify cracking, sagging or rat holing that may occur due to settlement of materials. Special attention to be paid to the high wall contact above areas where punch or auger mining took place as material may slump into the unfilled underground air space.	N/A	During rehabilitation
				Should cracking, sagging or rat holing along high wall contact be detected, ECO to initiate corrective action which should entail import of fill material and infilling of affected areas. If repaired areas exceed $1m^2$, the area should be reseeded by hand.	N/A	During rehabilitation
				Rehabilitation of the opencast areas on site will follow the mining cut and be completed within the operational phase of the project.	N/A	During rehabilitation
				No final voids will be left in the post-mining topography. All overburden material removed in mining from any individual pit will be returned to a pit and will be shaped to ensure all pit areas are free draining and are returned to pre-mining land capability.	N/A	During rehabilitation
All	Whole site	Natural vegetation / plant life	Re, Cl, Post Cl	Rehabilitation will have a positive effect	N/A	During closure
				Rehabilitated areas of grazing capability will comprise a grass community dominated by grasses of pasture origin. These areas will be managed by grazing. ECM to monitor re-grassed areas as indicated in order to demonstrate the trend towards	N/A	During rehabilitation

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				the areas becoming self-maintaining in these rehabilitated systems.		
				On arable areas, a gradual return to wilderness lands will be followed, whereby rehabilitated land will be integrated into the surrounding system as soon as practically possible.	N/A	During rehabilitation
				It is not anticipated that surface subsidence will occur associated with the opencast mined blocks. Some minor settlement may occur, however the pit is located on very gentle slopes and local settlement is unlikely to result in ponding of water. Special attention will be given to the area along the pit high wall where localised settlement may cause short-term cracking or rat holing. Should localised small depressions cracks or rat holes form however they will be corrected to be free draining (import of soil material, re-grading etc.).	N/A	During rehabilitation
				The rehabilitated ground will be monitored for cover and species composition and maintenance will include fertilising, cutting of the grass and replanting open patches of size greater than 2m x 2m.	N/A	During rehabilitation
				Samancor Chrome will remain the responsible party accountable for the end quality of rehabilitated areas within the mine site.	N/A	During rehabilitation
All	Whole site	Animals / Fauna	Re, Cl, Post Cl	Rehabilitation will have a positive effect, ECM could investigate the use of 1) brush packing that will provide cover for e.g. rodents, hares, invertebrates and 2) perches for birds. These will attract animals to the area and could assist with the distribution of seeds to the area by means of the animals' droppings.	N/A	During closure
Opencast	Will depend on current operational activities in a phased approach	Surface water	Re, Cl, Post Cl	The final voids will be sized so as not to decant and affect surface water flows	N/A	During rehabilitation
All	Whole site	Surface water	Re, Cl, Post Cl	The structures which could require maintenance are:	N/A	During rehabilitation
				Inspect the storm water diversion channels/berms associated with the routing of storm water around the remaining infrastructure. Inspections to be two monthly during the dry season (May to September).	N/A	Monthly

Activity	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Inspect dirty water management infrastructure monthly. Inspection to include pipeline from pit to silt trap and return water dams.	N/A	Monthly
				Maintenance of water pollution control structures	N/A	As needed
				Ensure that maintenance work is carried out as required.	N/A	As needed
				The recommendation in the previous approved EMPr (Menco 2012) that there will be no residue deposits on the ECM property and that the site will be fully rehabilitated on completion of mining is not feasible. TSFs will remain on site and will be rehabilitated as per an approved plan.	N/A	N/A
				Rehabilitation will have a positive effect	N/A	N/A
Opencast and Underground mining	Will depend on current operational activities in a phased approach	Ground-water	Re, Cl, Post Cl	The final voids will be sized so as not to decant and affect surface water flows	N/A	During rehabilitation
				Update groundwater assessment report before final closure	N/A	During rehabilitation
				Seal underground mining areas as soon as possible	N/A	During rehabilitation
All	Whole site	Noise and Vibration	Re, Cl, Post Cl	Ensure that employees wear protective gear when working	N/A	Continuous
All	Whole site	Socio-Economic structure	Re, Cl, Post Cl	Retrenchment packages should be paid to workers that are retrenched.	N/A	Before final closure
				Staff should be reallocated to other mines.	N/A	Before final closure
				Measures defined in the Social and Labour Plan in terms of reskilling prior to closure should be implemented.	N/A	Before final closure
All	Whole site	Socio-Economic structure	Re, Cl, Post Cl	Re-focus and diversification should be facilitated in accordance with sustainable development principles	N/A	Before final closure
All	Whole site	Socio-Economic structure	Re, Cl, Post Cl	Where possible employees must be assisted in finding employment at other sites.	N/A	Before final closure
All	Whole site	Land use	Re, Cl, Post Cl	Rehabilitation should take account of sustainable development opportunities and should be formulated with the local community	N/A	Before final closure

5. IMPACT MANAGEMENT OUTCOMES

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ()

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
New Tailings dam at TWF3 and old pit	Development related activities will lead to destruction of highly sensitive habitat (VU1) and overall loss of biodiversity within the clearance area. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Flora	Co, Op	Control Planning Rehabilitation	Design will be compliant with SANS standards and applicable legislation and be approved by the DWS. Pre-impact vegetation
New Tailings dam at TWF3 and old pit	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	Flora	Co, Op	Control Monitoring	No alien invasive plants on site
New Tailings dam at TWF3 and old pit	Development related activities may lead to the loss of floral species of conservation concern. Sixty-one (61) plant species listed on the SANBI database for the area are classified as species of conservation concern (SCC) according to the IUCN Red List status, the ToPS list, their endemism, the NFA and the LEMA. Six plant SCC were identified to occur on the proposed project footprint during the site survey. Development and related activities are likely to impact on the sensitive habitats related to the watercourses situated in and around the development footprint.	Flora	Co, Op	Control Planning Removal Monitoring	Identify SCC and relocate once permit is received Permits for relocation in place
Waste rock dump expansion	The WRD extension is largely planned on an area which forms part of VU4, which is highly degraded. Development related activities will not lead to significant destruction of habitat and overall loss of biodiversity.	Flora	Co, Op	Control Planning	Area for development demarcated
Waste rock dump expansion	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	Flora	Co, Op	Planning Monitoring Control	No alien invasive plants on site
TWF3 and pit tailings dam	TWF3 (where the opencast exists and will be backfilled) will suffer less severe ecological impacts due to the impacted nature of the area inside the existing mine. This activity could fragment	Fauna	Co, Op	Planning Education	Remove and relocate nests if possible Pre-impact vegetation

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
	ranges that certain animals may need to sustain adequate foraging area and breeding grounds.			Removal Rehabilitation	
TWF3 and pit tailings dam	Constructing activities and heavy construction vehicles entering into natural areas might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat	Fauna	Co, Op	Planning rehabilitation Education	Comply with Requirements of the EMPr Pre-impact vegetation Comply with Requirements of the EMPr and the Water Use Licence
TWF3 and pit tailings dam	Possible impacts on Species of Conservation Concern (SCC) associated with the area is a possibility, specifically if TSF1 is the chosen alternative. However, no nationally red listed species were observed during the field assessment, but is could still occur based on the condition of the habitat observed. Provincially listed species have been noted and impacts to these should be prevented and no hunting, catching or relocation of any species should occur without authorisation under LEMA. The expansion of the WRD is not expected to bring forth ecological impacts, since the area designated for development falls within the dirty footprint where the WRD already occurs.	Fauna	Co, Op	Planning rehabilitation Education	Comply with Requirements of the EMPr
TSF and WRD development	Impacts to the wildlife during the operational phase of the TSF and WRD developments could occur, depending on alternative utilized. TSF1 will have more severe ecological impacts than TSF3 and the expansion of the WRD. The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. The impacts are foreseen to be less severe than Construction phase, the threat of this stage is not the magnitude of the impact, rather the duration. This continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).	Fauna	Op	Planning rehabilitation Noise control Light control	Comply with Requirements of the EMPr Pre-impact vegetation As per Noise impacts identified Norms and standards for waste management activities as promulgated in terms of NEMWA

Activity	**Potential Impact**	**Aspects affected**	**Phase**	**Mitigation Type**	**Standard to be Achieved**
WRD Expansion	The construction activities might result in impacts on the natural environment, however, the footprint proposed for the WRD has been already developed and fall within a designated fenced area. The remaining natural environment within these areas were found to be already impacted as the current WRD is already located here.	Fauna	Co, Op	Planning Education Rehabilitation	Comply with Requirements of the EMPr Permits for relocation in place Pre-impact vegetation
WRD Expansion	Traffic and constant usage of heavy vehicles might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat. However, the area had already been fenced and occurs within an already impacted footprint, therefore, the occurrence of animal species and usable habitat within this area is not expected and impacts will remain low.	Fauna	Co, Op	Planning	Comply with Requirements of the EMPr
WRD Expansion	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. Since this is the extension of the WRD, these are already present on site and will only continue.	Fauna	Op	Planning Rehabilitation Noise control	Comply with Requirements of the EMPr Pre-impact vegetation As per Noise impacts identified
Site clearance for WRD expansion and TSF development	During this activity, a number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above-mentioned operations will have its own duration and potential for dust generation. Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)) It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This activity will be short-term and localised, seizing after construction activities. Material will be removed by using a bulldozer and then storing this material separately for use during rehabilitation at end of life of mine when the operation cease. These construction sites are ideal for dust suppression measures as land disturbance from clearing and excavation generates a large amount of soil disturbance and open space for wind to pick up dust particles and deposit it elsewhere (wind	Air quality	Co	Planning Management Rehabilitation	Regional Air Quality objectives if set, otherwise national objectives

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
	erosion). Issues with dust can also arise during the transportation of the extracted material, usually by truck and shovel methods, to the stock piles. The dust can further be created by the entrainment from the vehicle itself or due to dust blown from the back of the bin of the trucks during transportation of material to and from stockpiles				
Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, drilling, drilling blasting, etc.)	During this phase, it is anticipated there will be construction of infrastructure. This will include, access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust). The construction of roads take place through removing the topsoil and then grading the exposed surface in order to achieve a smooth finish for vehicles to move on. Temporary stockpiles will be created close to the edge of the road in order to be backfilled easily once the road has expired or need to be rehabilitated.	Air quality	Co	Dust management Planning Rehabilitation	Regional Air Quality objectives if set, otherwise national objectives Good practises Compliance with EMPr
General transportation, hauling and vehicle movement on site	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	Air quality	Co	Dust management Speed management Planning Rehabilitation	Regional Air Quality objectives if set, otherwise national objectives As per Air quality impacts identified
Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	Increase in PM10 concentrations was not predicted to exceed 75 µg/m³ limit for any of the sensitive receptors. The annual average PM10 limit of 40 µg/m³ are predicted not to exceed at any of the identified sensitive receptors for the unmitigated or mitigated scenarios.	Air quality	Op	N/A	Refer to Construction phase measures.

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	No sensitive receptors are predicted to exceed the monthly dust fallout for the highest month residential limit of 600 mg/m²/day. The predicted annual dust fallout for the unmitigated and mitigated scenarios are not predicted to exceed the annual limit of 300 mg/m²/day at any of the sensitive receptors	Air quality	Op	N/A	Refer to Construction phase measures.
New TSF, WRD Expansion	Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture.	Flora	Cl, Post Cl	Planning Monitoring Control Rehabilitation	As per Fauna and Flora impacts identified Pre-impact vegetation
New TSF, WRD Expansion	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area the same manner as may be expected in the construction phase, although these impacts are short term and followed by increased habitat restoration and decreased movement within the area. The possibility exists for rehabilitation to be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance.	Fauna	Cl, Post Cl	Rehabilitation Education	N/A As above
Demolition and removal of all infrastructures including transportation of site	The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions. The impacts will be short-term and localised. Any implication or implications this phase will have on ambient air quality will seize once the activities are finalised	Air Quality	Cl, Post Cl	Planning Maintenance Dust management	Good practises
Rehabilitation (Spreading of soil, re-vegetation and profiling / contouring)	During this activity, there is the reshaping and restructuring of the landscape. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Air quality	Cl, Post Cl	Rehabilitation Planning Maintenance Dust management	N/A
Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	Noise	Op	N/A	As per Noise impacts identified

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	Noise	Op	N/A	N/A
Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Surface water	Op, , Cl, Post Cl	Control through management and planning	N/A
Storm water management for the new TSF and associated infrastructure	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.	Surface water	Op, , Cl, Post Cl	Control through management and planning	Promulgated regulations
Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	Noise	Co	N/A	N/A
Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	Noise	Co	N/A	N/A
Construction of the New TSF, TSF reclamation and WRD Expansion	Disturbance / Loss of the Soil Resource	Soils	Co	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures As per Fauna and Flora impacts identified As per surface water impacts identified As per Air quality impacts identified As per groundwater impacts identified
Ineffective housekeeping and management of stockpiles and exposed soils as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss of the Soil due to erosion as well as contamination	Soils	All phases	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF	Cumulative disturbance, loss and degradation of soils	Soils	Pl, Co, Op	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
reclamation and WRD expansion					
Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Increased / Decreased sediment loads on downstream systems	Soils	Cl	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Stripping of soils, Clearing of vegetation and stockpiling of materials as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss / Sterilization of inherent land capability and land use.	Land capability and land use	Pl, Co, Op	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Continued clearing, disturbance, laydown, stockpiling and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Loss of land services, ecosystems support and services	Land capability and land use	All phases	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Access road and stream diversion construction activities	Disturbance / loss of soil resources	Soils	Co	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Ineffective housekeeping and management of stockpiles and exposed soils as a result of the Access road and stream diversion	Disturbance / loss of soil due to erosion as well as contamination	Soils	All phases	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Continued activities inclusive of mining and transportation as a result of the access road and stream diversion	Cumulative Disturbance / loss and degradation of soils	Soils	All phases	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Continued activities inclusive of mining and transportation as a result of the Access road and stream diversion	Increased / decreased sediment loads on downstream systems	Soils	Cl	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Stripping of soils, clearing of vegetation and stockpiling of materials for road and river diversion	Disturbance / loss / sterilisation of inherent land capability and land use	Land capability and land use	Pl, Co, Op	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
Continued clearing, disturbance, lay down, stockpiling and transportation for road and river diversion	Cumulative Disturbance / loss / sterilisation of inherent land capability and land use	Land capability and land use	All phases	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Vegetation removal	Vegetation removal (though already disturbed footprint area) could result in siltation of the watercourse should this activity occur during the rainfall season. As a result of the vegetation removal, the existing flow regime and micro habitats created by the existing diversion would be altered.	Surface water	Co	Planning Management Storm water management	Compliance with EMPr recommendations and management measures
Vegetation removal	The potential for hydrocarbon spills from machinery working within 100 m from a watercourse is a possibility.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures
Diversion of the unnamed tributary around the new TSF and associated infrastructure	It is recommended that a formal river diversion be designed around the new footprint area of the TSF and associated infrastructure. This will have a positive impact on the flow regime, habitat, water quality and biota of the watercourse and allow for the connection of the upstream and downstream area.	Surface water	Op	Planning Management Authorisations Inspections	Compliance with EMPr recommendations and management measures. Ensure that licences are in place for water use activities. As per licence conditions As per identified fauna and flora impacts
Diversion of the unnamed tributary around the new TSF and associated infrastructure	Negative aspects associated with the construction of the proposed diversion may include siltation and temporary impacts on flow regime, habitat and biota.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures
Diversion of the unnamed tributary around the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures
Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures
Storm water management for the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures
Construction of the TSF and associated infrastructure liner system	During construction of the TSF and associated infrastructure impacts on water quality due to siltation as a result of the loosening of material may occur. The potential impacts on the surface water quality could impact on the habitat and biota of affected watercourses.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
Construction of the TSF and associated infrastructure liner system	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.	Surface water	Co	Planning Management	Compliance with EMPr recommendations and management measures
Operation of the TSF and associated infrastructure	No additional impacts on the flow regime is expected as it is covered in the storm water management required for the site. During the operational phase leachate from the TSF and associated infrastructure if the incorrect liner is installed or of the liner is damaged may impact on the baseflow water quality.	Surface water	Op	Planning	Compliance with EMPr recommendations and management measures
Operation of the TSF and associated infrastructure	Spills from the pipeline would result in impacts on the water quality (should the tributary be flowing at the time). If spills are not cleaned it could result in base flow water quality impacts. This in turn could impact on the habitat and the biota.	Surface water	Op	Management	Compliance with EMPr recommendations and management measures
Operation of the TSF and associated infrastructure	TSF breaching could result in impacts on water quality, habitat and Biota should a break occur on the east, south or western sides of the TSF. The potential range of the impact has been modelled by Tailings solutions.	Surface water	Op	Management	Comply with the operational guideline for tailings deposition to ensure that dam wall integrity is not compromised.
Backfilling of the historic pit area with Tailings	No liner is possible in the pit thus it will not be possible to reduce leachate to the baseflow of the watercourse. This will have an impact on the baseflow water quality of the watercourse and have a negative impact on the water quality in the Dwars river. Please also refer to the geohydrological assessment.	Surface water	Op	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The increase in soil to act as a capping material may result in wind-blown dust and potential siltation that could impact on biota and the habitat. The vegetation of the TSF and associated infrastructure is a positive aspect.	Surface water	Cl, Post Cl	Planning Management Rehabilitation	Compliance with EMPr recommendations and management measures As per Closure plan
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	During the closure phase the movement of machinery may result in hydrocarbon spills that could impact on water quality, biota, habitat and vegetation.	Surface water	Cl	Planning Management	Compliance with EMPr recommendations and management measures
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The potential of leachate generated by the TSF and associated infrastructure is still a possibility and could result on impacts on quality, biota and vegetation.	Surface water	Cl, Post Cl	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Re-mining of TSF facilities	Pumping of mobilised fines across the diverted tributary could impact on water quality, habitat and biota should a spill occur.	Surface water	Op	Management	Compliance with EMPr recommendations and management measures

Activity	**Potential Impact**	**Aspects affected**	**Phase**	**Mitigation Type**	**Standard to be Achieved**
Re-mining of TSF facilities	Should the liner system be compromised as a result of the re-mining this could impact on the surface water quality, habitat and biota.	Surface water	Op	Planning Methodology Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
					As per groundwater impacts identified
Construction of the new TSF and the WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	Visual	Co	Management	Compliance with EMPr recommendations and management measures
Permanent nature of the new TSF and WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	Visual	Op, Cl, Post Cl	Planning Management Rehabilitation	Compliance with EMPr recommendations and management measures
					As per Fauna and Flora impacts identified
New TSF (TWF1 or TWF3 options)	Pollution Plume	Ground-water	Cl, Post Cl	Design, Planning, Monitoring	Compliance with EMPr recommendations and management measures
					As per surface water impacts identified
Existing TSF	Pollution Plume	Ground-water	Cl, Post Cl	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
					EMPr compliance
WRD	Pollution Plume	Ground-water	Cl, and post Cl	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Underground Mine - planned, inclusive of surface facilities	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	Ground-water	Cl, Post Cl	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Underground mine - Existing	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	Ground-water	Cl, Post Cl	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Underground Mine - planned	Dewatering could result in < 1 m water level decline	Ground-water	Op	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
Underground mine - Existing	Dewatering could result in < 1 m water level decline	Ground-water	Op	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Cumulative of all activities	Pollution Plume	Ground-water	Op, Post Cl	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
TWF1 option	Potential impact on artefacts.	Archaeo-logical	Op	Collection and preservation of artefacts	SANS Permit
Movement of trucks, excavators and other mining equipment.	Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active. The noise levels will increase to 90 - 100 dBA during day time (5h00 – 19h00). Rock breakers and blasting for the excavation during mining operations will generate noise levels of 100 – above 120 dBA respectively. The closest village (Mahlagari) to Tweefontein is 8 km away and less likely to be impacted due to it being further away from the site. Noise rating for activities similar to that proposed at Tweefontein mine vary between 50 dB (A) and 57.8 dB (A).	Socio Economic	Op	Maintenance Planning Personal protective equipment Compliance with guidelines and safe practises	As per Noise impacts identified SANS Blasting Mine Health and Safety standards As per Noise impacts identified
Cumulative of all activities	The noise impacts of the proposed Tweefontein Project and exiting Mahlagari village (08km) and retail/commercial activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	Socio Economic	All	As above	As above
Movement of trucks, excavators and other mining equipment, including mining activities	Controlled movement of haul trucks and light delivery vehicles (LDVs) around the site will generate some nuisance dust into the atmosphere. Dust will also be generated from the opencast pits, access roads to and from the open pits and crusher/plant sites.	Socio Economic	All	Dust suppression Monitoring Personal Protective equipment Rehabilitation	As per Air quality impacts identified Mine Health and Safety standards As per Fauna and Flora impacts identified
All	Cumulative impact on air quality	Socio-Economic	All	As above	As above
All	Visual impact will result from the visual contrast of the site with the surrounding areas due to the following factors: § The crushing and screening activities create a high visual contrast with the surrounding areas, which are greener and less uniform. In the first phase of rehabilitation, trees and natural vegetation will be used to disguise or buffer the mine workings	Socio Economic	All	Rehabilitation Planning	As per Ecological and Visual impacts identified

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
	as far as possible and provide some degree of stabilization of the substrate; § The position of the mine workings, tailings storage facility and waste rock dump above the R555 Road, which raises it above the level of any naturally occurring tree, making it more visible; § The relatively undeveloped nature of the surrounding area immediately reveals the presence of man-made infrastructure and man-made forms (straight lines, bold colours etc.) The proposed SECM Tweefontein opencast activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine will be visible from R555 main road.				
All	The proposed additional mining infrastructure at Tweefontein Mine may form part of the “sense of place” in the long term, even after operations cease.	Socio Economic	All	As above	As above
All	The construction and expansion of the Tweefontein mine surface infrastructure including crushing and screening plant, tailings dam, waste rock dumps, access roads and opencast pits will require topsoil stripping and clearing of vegetation. The inherent land capability will be permanently lost below the footprint of these mining entities. The severity of the impact is considered to be of moderate to high significance. The reason for the moderate severity is that the land is zoned for mining and currently being mined by SECM. The proposed opencast pits and mining infrastructure will not alter the land use at the mine footprint due to current mining activities at the Tweefontein mine. The additional mining infrastructure will add to the existing impacts of air pollution due to dust, visual impacts, and extraction of water for mining purposes due the existing mining operations. There is no major impact on the land use since the area is already zoned for mining. The positive impact of mining in the project area include increased business opportunities, greater demand for goods and services, pressures for housing (ability to own houses), etc.	Socio Economic	All	Rehabilitation Planning	As per Fauna and Flora impacts identified
All	Cumulative impacts on land use due to secondary industries that may be developed around the areas to provide support services and material to the mine. Urbanization and modern residential developments also likely.	Socio Economic	All	As above	As above

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
TSF and WRD development	Three (3) archaeological sites were identified in the TSF1 area during the September 2020 (A. Pelser) fieldwork, dating to the Stone- and Iron Age periods, but there is a high likelihood that more are located in the TSF1 area and in the expansive erosion donga that is partially situated within the area and bordering the area. It is therefore important that the TSF1 area be studied in more detail as part of Phase 2 Archaeological Mitigation before mining activities commence. TSF1 is not the preferred site for the proposed tailings facility and therefore the said three sites will not be impacted on.	Socio Economic	Co, Op	As above	Applicable permits in place if needed
All	Any further mining development will form part of the history of the local area. No other cumulative impacts are anticipated.	Socio Economic	All	Implementing Policies and plans Community participation	As above
All	Crime is commonly in most settlement areas and the community of Mahlagari is not different. However, due to the rural nature of the settlements, crime may be lower comparative to urban centres such as Burgersfort. The traditional livelihoods and sharing of communal resources in rural settlements also minimizes crime to some extent. Crime and HIV statistics in Mahlagari village have NOT been verified in this SEA study, however as a general norm influx of foreign people and job seekers in communities adjacent to large scale projects such as the Tweefontein mine project is inherent. HIV and crimes such as theft, sex crimes, traffic violations, fraud and drugs are possible, and likely to increase if not managed and policed because of the Tweefontein mine project. Influx of foreigners and job seekers and increase in disposable income for local people may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Socio Economic	All	Implementing Policies and plans Community participation	Existing Policies
All	Cumulative impact on Crime, Covid-19 and HIW	Socio Economic	All	As above	As Above
All	Mahlagari village is a village in Steelpoort and the closet and most likely to be affected by to the Tweefontein mine project. It is characterized by rural to semi-rural settlements with high levels of poverty and high unemployment levels as well as low literacy levels. The region's economy is derived from a variety of sectors, of which mining and agriculture are the main contributors. A high percentage of residents in the local village of Mahlagari	Socio Economic	All	As above	Existing Policies

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
	are unemployed. The mine will alleviate this unemployment problem, though it will not eradicate it completely. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The life of mine (LOM) is expected to be over 20 years, which translate to 20 years and more of economic activity in the region. The social and labour plan (SLP) to be implemented by the SECM Tweefontein Project will contribute to the development of the adjacent community in terms of skills training, local economic development projects, and improved infrastructure.				
All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Crime impacts	Socio Economic	All	As above	As Above
All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Employment impacts	Socio Economic	Al	As above	As Above
TSF Operation	Potential loss of resource and life should TSF dam failure occur on northern wall	Socio Economic	Op	As per TSF failure under Surface water	As per TSF failure under Surface water
Opencast mining and Underground mining areas	Loss of chrome resource	Geology	Op	None	N/A
Opencast mining areas	Voids left as a result of chrome removal at Opencast areas	Topography	Op	Remedy Rehabilitation Design measures	N/A
All	Impact on pre-mining and operational topography	Topography	Op	Remedy Rehabilitation Design measures	N/A
All	Loss of topsoil during stripping, handling and placement on rehabilitated areas	Soils	Op	Remedy Rehabilitation Design measures	N/A
All	Loss of topsoil fertility as a result of changes to the physical, chemical and biological soil properties which could affect the potential land use	Soils	Op	Remedy Rehabilitation Design measures	N/A
All	Contamination of soils by fuels and lubricants from mining and associated equipment	Soils	Op	Remedy	N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
All	Change of land use from wilderness to mining and back to wilderness	Land capability	Op	Rehabilitation	Compliance with Closure plan
All	Impact on wilderness land used for mining activities	Land use	Op, Cl	Rehabilitation	N/A
Opencast mining and Underground mining areas	Management of un-mined land at Tweefontein	Land use	Op	Design measures	N/A
All	Loss of rare plant species that occur on site	Natural vegetation / plant life	Op	Design measures Avoidance Relocation	EMPr compliance Permits for relocation in place
All	Growth of alien invasive plant species on site	Natural vegetation / plant life	Op	Monitoring Remedy	N/A
All	Loss of species diversity and habitat characteristics due to mining	Natural vegetation / plant life	Op	Remedy Rehabilitation	N/A
All	Loss of indigenous animals	Animals / Fauna	Op	Planning Control behaviour Education	N/A
All	Reduction in surface water quantity (volume of water to the receiving environment)	Surface water	Op	Design controls Planning Treatment storm water controls Rehabilitation Monitoring	Good practises Municipal bylaws N/A
All	Impact on surface water quality	Surface water	Op	Design controls Planning Treatment storm water controls Rehabilitation Monitoring	N/A
Opencast and Underground mining	Alteration of the natural river / water courses	Surface water	Op	Planning Design parameters Rehabilitation	N/A
All	Lowering of groundwater levels due to mining related activities	Groundwater	Op	Rehabilitation Monitoring Compensation	N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
All	Negative impact on groundwater quality as a result of mining activities and tailings dams	Groundwater	Op	Rehabilitation Monitoring Compensation	N/A
Operation of Tailings facilities	Elevated water levels due to recharge from tailings dams	Groundwater	Op	Monitoring	N/A
All	Impact on air quality as a result of operation dust and gaseous emissions	Air quality	Op	Dust control Monitoring Vehicle servicing Rehabilitation	N/A
Opencast mining	Mining operations within open pit area will impact on Dust fallout (nuisance dust)	Air quality	Op	Air quality monitoring and quantification	N/A
Processing plans, Stockpiles, opencast and Underground mining	Material handling operations will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
Processing plants	Crushing will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
All	Vehicle entrainment on unpaved roads will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
All	Vehicle entrainment on paved roads will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
All	Continuous rehabilitation activities will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
Tailings dams	Wind erosion from tailings dam will impact on Dust fallout (nuisance dust)	Air quality	Op	Rehabilitation	N/A
Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Dust fallout (nuisance dust)	Air quality	Op	Rehabilitation	N/A
Overburden and waste rock dump	Wind erosion from overburden / waste rock storage pile will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
ROM Stockpiles	Wind erosion from ROM storage piles will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
Opencast mining	Drilling and blasting activities – opencast will impact on Dust fallout (nuisance dust)	Air quality	Op	Dust control	N/A
Opencast mining	Mining operations within open pit area will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Processing plants and Opencast mining, stockpile areas	Material handling operations will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Processing plant	Crushing will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
All	Vehicle entrainment on unpaved roads will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
All	Continuous rehabilitation activities will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Tailings dams	Wind erosion from tailings dam will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Overburden and waste rock dump	Wind erosion from overburden / waste rock storage pile will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
ROM Stockpiles	Wind erosion from ROM storage piles will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Opencast mining	Drilling and blasting activities – opencast will impact on Respirable dust (PM10)	Air quality	Op	Dust control	N/A
Opencast mining	Blasting of overburden and reef will impact on Gaseous emissions	Air quality	Op	Vehicle control	N/A
All	Release of exhaust emissions from vehicles on paved and unpaved roads will impact on Gaseous emissions	Air quality	Op	Vehicle control	N/A
Underground mining	Release of underground emissions due to diesel operating machinery will impact on Gaseous emissions	Air quality	Op	Control	N/A
All	Increased noise levels as a result of the mining activities above acceptable levels	Noise and Vibration	Op	Noise control Planning Monitoring	SANS Blasting
Opencast	Risk to humans and equipment as a result of fly rock	Noise and Vibration	Op	Planning Design	SANS Blasting
All	Sensitive landscapes present in the vicinity of Tweefontein are the Steelpoort River and Dwars River floodplains and riparian zones.	Sensitive landscapes	Op		N/A
All	Visibility of the mining activities may impact on the sense of place, visual equity	Visual aspects	Op	Visual control Planning Design Rehabilitation	N/A
Opencast	Damage to the village from the recent past	Archaeo-logical and cultural interest	Op	Planning Authorisations	N/A
Opencast	Graveyard may be damaged by mining operation	Archaeo-logical and cultural interest	Op	Education Planning	N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
Opencast	Destruction of mining heritage remains	Archaeo-logical and cultural interest	Op	Authorisations	N/A
All	Influx of job seekers into the area	Socio-Economic structure	Op	Planning Policy Implementation Communication	N/A
All	Impact on community safety as a result of mining activities	Socio-Economic structure	Op	Planning Control	N/A
All	Increase in Social pathologies due to influx of job seekers	Socio-Economic structure	Op	Planning Policy implementation	N/A
All	Accommodation and social services limitations	Socio-Economic structure	Op	Planning Policy implementation	N/A
All	Road maintenance and safety	Socio-Economic structure	Op	Planning	N/A
All	Safety of Children	Socio-Economic structure	Op	Planning Control	N/A
All	Aesthetics and impacts on sense of place	Socio-Economic structure	Op	Planning Control	N/A
All	Potential Health impacts	Socio-Economic structure	Op	Planning Health Assessments	N/A
All	Influx of job seekers into the area	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	Employment and income generation	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	The use of current employees as construction workers	Socio-Economic structure	Op	Planning Policy Implementation	N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
All	Increase in indirect employment opportunities and local expenditure	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	local and regional economic benefits and multipliers	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	Growth in the local housing sector	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	Development of BEE and SMME opportunities	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	Corporate and social investment	Socio-Economic structure	Op	Planning Policy Implementation	N/A
All	General	Socio-Economic structure	Op	N/A	N/A
All	No additional impacts expected	Geology	Re, Cl, Post Cl		As above
All	No additional impacts expected	Topography	Re, Cl, Post Cl		As above
All	No additional impacts expected	Soils	Re, Cl, Post Cl		N/A
All	No additional impacts expected	Land capability	Re, Cl, Post Cl		N/A
All	No additional impacts expected	Land use	Re, Cl, Post Cl		N/A
All	No additional impacts expected	Natural vegetation / plant life	Re, Cl, Post Cl		N/A
All	No additional impacts expected	Animals / Fauna	Re, Cl, Post Cl	N/A	N/A
Opencast	Effect of final void on catchment yield	Surface water	Re, Cl, Post Cl	Rehabilitation	N/A
All	Effect on surface water quality	Surface water	Re, Cl, Post Cl	Rehabilitation Infrastructure maintenance	N/A
Opencast and Underground mining	Possibility for Decant from mining operations	Groundwater	Re, Cl, Post Cl	Rehabilitation Planning	N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
				Modelling Planning	
Tailings dams	Elevated water levels due to recharge from the tailings dam	Groundwater	Re, Cl, Post Cl	N/A	N/A
Tailings dams	Nitrate pollution from migration from tailings dam	Groundwater	Re, Cl, Post Cl	N/A	N/A
Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Rehabilitation Control	N/A
Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Dust control	N/A
All	Infrastructure removal will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Dust control	N/A
All	Vehicle entrainment on unpaved roads will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Dust control	N/A
All	Vehicle entrainment on paved roads will impact on dust fallout (nuisance dust)	Air quality	Re, Cl, Post Cl	Dust control	N/A
Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Dust control	N/A
Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Dust control	N/A
All	Infrastructure removal will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Dust control	N/A
All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	Air quality	Re, Cl, Post Cl	Dust control	N/A
All	Demolition of infrastructure – blasting will impact on Gaseous emissions	Air quality	Re, Cl, Post Cl	Vehicle control Dust control	N/A
All	Tailpipe emissions from vehicles will impact on Gaseous emissions	Air quality	Re, Cl, Post Cl	Vehicle control	N/A
All	Increase in noise levels as a result of demolition of infrastructure	Noise and Vibration	Re, Cl, Post Cl	Noise control Planning Monitoring	N/A
All	No additional impacts expected	Sensitive landscapes	Re, Cl, Post Cl		N/A
All	No additional impacts expected	Visual aspects	Re, Cl, Post Cl		N/A
All	No additional impacts expected	Archaeological and cultural interest	Re, Cl, Post Cl		N/A

Activity	Potential Impact	Aspects affected	Phase	Mitigation Type	Standard to be Achieved
All	Cessation of employment	Socio-Economic structure	Re, Cl, Post Cl	Policy Implementation Planning	N/A
All	Reduced economic activity	Socio-Economic structure	Re, Cl, Post Cl	Policy Implementation Planning	N/A
All	Potential re-employment of employees	Socio-Economic structure	Re, Cl, Post Cl	N/A	N/A
All	Changed land-use after rehabilitation	Land use	Re, Cl, Post Cl	Rehabilitation	N/A

6. 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).

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
New Tailings dam at TWF3 and old pit	Development related activities will lead to destruction of highly sensitive habitat (VU1) and overall loss of biodiversity within the clearance area. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads. It is recommended that red data species be fenced off for additional protection.	Design will be compliant with SANS standards and applicable legislation and be approved by the DWS.	During the planning and construction phase. Monitor vegetation and alien invasive species annually.
		The operational area should be fenced in order to reduce human and vehicle traffic to areas outside of the demarcated mining area.	N/A	Life of mine
		The vegetation removal during the construction phase should be controlled and very specific.	N/A	Before construction begins
		Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should be prioritised.	Pre-impact vegetation	Continually

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
New Tailings dam at TWF3 and old pit	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.	No alien invasive plants on site	Life of mine
New Tailings dam at TWF3 and old pit	Development related activities may lead to the loss of floral species of conservation concern. Sixty-one (61) plant species listed on the SANBI database for the area are classified as species of conservation concern (SCC) according to the IUCN Red List status, the ToPS list, their endemism, the NFA and the LEMA. Six plant SCC were identified to occur on the proposed project footprint during the site survey. Development and related activities are likely to impact on the sensitive habitats related to the watercourses situated in and around the development footprint.	All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas.	Identify SCC and relocate once permit is received	Before construction commence
		If any SCC are encountered within the subject property in the future, the following should be ensured:		
		If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property.	N/A	As needed
		All rescue and relocation plans should be overseen by a suitably qualified specialist.	N/A	As needed
		Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed.	Permits for relocation in place	As needed
		Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.	N/A	As needed
Waste rock dump expansion	The WRD extension is largely planned on an area which forms part of VU4, which is highly degraded. Development related activities will not lead to significant destruction of habitat and overall loss of biodiversity.	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads.	Area for development demarcated	Before construction commence
		The operational area should be fenced in in order to reduce human and vehicle traffic to areas outside of the demarcated operational area.	N/A	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		The vegetation removal during the construction phase should be controlled and very specific.	N/A	Construction phase
Waste rock dump expansion	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas. These species may also compete with indigenous species and will degrade the veld condition by making it unfeasible for other land-uses such as grazing and agriculture.	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.	No alien invasive plants on site	Life of mine
TWF3 and pit tailings dam	TWF3 (where the opencast exists and will be backfilled) will suffer less severe ecological impacts due to the impacted nature of the area inside the existing mine. This activity could fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds.	The construction area should be well demarcated and construction workers should not enter adjacent areas.	Remove and relocate nests if possible	Before construction commence
		Any nests encountered during the establishment of the TSF should be avoided at all stages.	N/A	Life of mine
		Roads present at TWF3 (within the mine boundary) should be utilised if TWF3 backfilled and developed.	N/A	Continually
		To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continually
		Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.	Pre-impact vegetation	Continually
TWF3 and pit tailings dam	Constructing activities and heavy construction vehicles entering into natural areas might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat.	Roads to be utilised during establishment and site clearance should be demarcated and planned to avoid vehicles entering areas which would not have been impacted if proper planning had occurred. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	Comply with Requirements of the EMPr	Life of mine

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
		Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.	Pre-impact vegetation	Continually
		Seed mixes should match the surrounding vegetation structures and those specifically found in the Sekhukhune Plains Bushveld and Sekhukhune Mountain Bushveld vegetation types.	Pre-impact vegetation	As needed
		Prevent impacts to the drainage lines identified during the field visit.	Comply with Requirements of the EMPr and the Water Use Licence	Continually
TWF3 and pit tailings dam	Possible impacts on Species of Conservation Concern (SCC) associated with the area is a possibility, specifically if TSF1 is the chosen alternative. However, no nationally red listed species were observed during the field assessment, but is could still occur based on the condition of the habitat observed. Provincially listed species have been noted and impacts to these should be prevented and no hunting, catching or relocation of any species should occur without authorisation under LEMA. The expansion of the WRD is not expected to bring forth ecological impacts, since the area designated for development falls within the dirty footprint where the WRD already occurs.	To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors’ employees.	Comply with Requirements of the EMPr	Life of mine
		Corridors between the drainage channels and river systems should always be maintained during construction and operational phases, unless authorised to divert or alter.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
		Changes that will impact the drainage lines should be subjected to the appropriate rehabilitation of riparian zones and ecological rehabilitation in terms of vegetation to ensure habitat stays favourable for species that may have specialised niches that depend on these aquatic systems.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
TSF and WRD development	Impacts to the wildlife during the operational phase of the TSF and WRD developments could occur, depending on alternative utilized. TSF1 will have more severe ecological impacts than TSF3 and the expansion of the WRD. The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise	Fencing the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a controlled environment.	Comply with Requirements of the EMPr	Life of mine
		Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase is speedily managed and restored. This included erosion and the management of Invasive plant species that may decrease the integrity of the Sekhukhune vegetation types as a specialised habitat for animals.	Pre-impact vegetation	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	and waste management is the main impacts that should be managed within this phase. The impacts are foreseen to be less severe than Construction phase, the threat of this stage is not the magnitude of the impact, rather the duration. This continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).	Noise impacts should be monitored and kept in accordance with the regulated standard prescribed for the zoning of the area.	As per Noise impacts identified	Life of mine
		The usage of special lighting in the evenings should ideally be investigated in terms of feasibility aiming to limit disturbance of animals (especially many SCC animals are deemed nocturnal) and the attraction of insects to these lights that often lead to their death. The current use of high-power security lighting for public areas and domains have a devastating effect on the nocturnal animals and insects by attracting them away from their natural environment, leading to certain death. A Mercury arc and halogen lamps emit light in the white spectrum, disorientating nocturnal insects and animals and in turn prevents mating and depletes the natural environment of many species as they die circling the lights. Yellow Sodium lights are prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife and the more natural areas. Sodium lamps require a third less energy. Potentially shades can be place over lights to redirect light down.	As per visual impacts identified	Life of mine
		Prevent impacts and waste from reaching the various drainage areas and areas outside the dirty footprint areas. Waste that is not managed correctly may enter the environment or contaminate the river systems and therefore the aquatic ecosystems during a rain event. This should be prevented by storing hazardous wastes in bunded areas and ensuring the TSF and WRD complies with the specific liners required to prevent leaching into the environment.	Norms and standards for waste management activities as promulgated in terms of NEMWA	Life of mine
		Strict rules should be adhered to offenders entering the natural environment outside of the footprint.	N/A	Life of mine
WRD Expansion	The construction activities might result in impacts on the natural environment, however, the footprint proposed for the WRD has been already developed and fall within a designated fenced area. The	The construction area should be well demarcated and construction workers should not enter adjacent areas;	Comply with Requirements of the EMPr	Life of mine
		Any nests encountered should be avoided as much as possible.	N/A	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	remaining natural environment within these areas were found to be already impacted as the current WRD is already located here.	To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	Permits for relocation in place	Life of mine
		Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.	Pre-impact vegetation	Life of mine
WRD Expansion	Traffic and constant usage of heavy vehicles might result in compaction of the soil and destruction of vegetation habitat which will impact on the animals that use the area as habitat. However, the area had already been fenced and occurs within an already impacted footprint, therefore, the occurrence of animal species and usable habitat within this area is not expected and impacts will remain low.	Implement all other mitigation measures prescribed and manage the expansion as per current WRD area to prevent any new impacts stemming from the expansion	Comply with Requirements of the EMPr	Life of mine
WRD Expansion	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area. Movement, noise and waste management is the main impacts that should be managed within this phase. Since this is the extension of the WRD, these are already present on site and will only continue.	Enclosing and containment of the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a controlled environment.	Comply with Requirements of the EMPr	Life of mine
		Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase are speedily managed and restored. This includes erosion and the management of Invasive plant species.	Pre-impact vegetation	Life of mine
		Noise impacts should be monitored and kept in accordance with the regulated standard prescribed for the zoning of the area.	As per Noise impacts identified	Life of mine
		Strict rules punishment should be adhered to offenders entering the natural environment outside of the footprint.	N/A	Life of mine
		Implement all the EMPr requirements as prescribed for the WRD footprint area (since this is only an extension).	Comply with Requirements of the EMPr	Life of mine
Site clearance for WRD expansion and TSF development	During this activity, a number of operations take place such as land clearing, topsoil removal, loading of	Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere.	Regional Air Quality objectives if set,	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above-mentioned operations will have its own duration and potential for dust generation. Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)) It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This activity will be short-term and localised, seizing after construction activities. Material will be removed by using a bulldozer and then storing this material separately for use during rehabilitation at end of life of mine when the operation cease. These construction sites are ideal for dust suppression measures as land disturbance from clearing and excavation generates a large amount of soil disturbance and open space for wind to pick up dust particles and deposit it elsewhere (wind erosion). Issues with dust can also arise during the transportation of the extracted material, usually by truck and shovel methods, to the stock piles. The dust can further be created by the entrainment from the vehicle itself or due to dust blown from	Should any fine materials (e.g. product) be transported it is recommended that it be covered with a tarp.	otherwise national objectives	
		Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur.	N/A	Life of mine
		Topsoil should be re-vegetated to reduce exposure areas.	N/A	As needed
		During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised.	N/A	Continually
		Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads.	N/A	As needed
		When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads.	N/A	Continually
		Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form.	N/A	Continually
		Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect.	N/A	As needed
		Any crusting of the surface binds the erodible material.	N/A	As needed
		All stockpiles to be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation).	N/A	As needed
		Successful trialling of broad acre temporary rehabilitation of unshaped overburden emplacement areas by aerial sowing of a cover crop, providing an established vegetative stabilisation to minimise the potential for windblown dust generation.	N/A	As needed
		Constricting the areas and time of exposure of pre-strip clearing in advance of mining development.	N/A	Life of mine

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
	the back of the bin of the trucks during transportation of material to and from stockpiles.			
Construction of surface infrastructure (e.g. access roads, pipes, storm water diversion berms, drilling, drilling blasting, etc.)	During this phase, it is anticipated there will be construction of infrastructure. This will include, access roads, pipes, storm water diversion berms, change houses, admin blocks, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust). The construction of roads take place through removing the topsoil and then grading the exposed surface in order to achieve a smooth finish for vehicles to move on. Temporary stockpiles will be created close to the edge of the road in order to be backfilled easily once the road has expired or need to be rehabilitated.	Dust emitted during bulldozing activity can be reduced by increasing soil dampness by watering the material being removed thus increasing the moisture content. The potential use of dust collected and filters on drill rigs should be investigated.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
		Another option would be to time the blasting with wind to ensure the dust will not be blown to the sensitive receptors or especially the community.	Good practises	As needed
		Blasting should also not take place when poor atmospheric dispersion is expected i.e. early morning and late evening.	Good practises	Continually
		Material need to be removed to dedicated stockpiles to be used during rehabilitation.	Compliance with EMPr	Continually
		This hauling of materials should take place on roads which is being watered and/or sprayed with dust suppressant.	Good practises	Continually
		To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	Good practises	As needed
		Constricting the areas and time of exposure of pre-strip clearing in advance of construction to limit exposed soil surfaces.	Compliance with EMPr	Life of mine
General transportation, hauling and vehicle movement on site	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface	Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
		To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	As per Air quality impacts identified	As needed
		Management should fit roads with speed humps to ensure adherence.	N/A	As needed
		Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.	As above	As needed

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
	operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	The drop heights should be minimised when depositing materials to the ground.	As above	Continually
		Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily.	N/A	Continually
Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	Increase in PM10 concentrations was not predicted to exceed 75 µg/m³ limit for any of the sensitive receptors. The annual average PM10 limit of 40 µg/m³ are predicted not to exceed at any of the identified sensitive receptors for the unmitigated or mitigated scenarios.	Refer to Construction phase measures.	Refer to Construction phase measures.	Refer to Construction phase measures.
Dust from Material handling and wind erosion from stockpiles (WRD and new TSF)	No sensitive receptors are predicted to exceed the monthly dust fallout for the highest month residential limit of 600 mg/m²/day. The predicted annual dust fallout for the unmitigated and mitigated scenarios are not predicted to exceed the annual limit of 300 mg/m²/day at any of the sensitive receptors	Refer to Construction phase measures.	Refer to Construction phase measures.	Refer to Construction phase measures.
New TSF, WRD Expansion	Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable	A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
		Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase.	N/A	Life of mine
		Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied.	N/A	Life of mine

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
	for post-closure land use activities such as wilderness, grazing and agriculture.	Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary. A report should be written and stored and should be available at all times.	Pre-impact vegetation	Life of mine
New TSF, WRD Expansion	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area the same manner as may be expected in the construction phase, although these impacts are short term and followed by increased habitat restoration and decreased movement within the area. The possibility exists for rehabilitation to be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance.	Positive impacts will start outweighing any negative impacts after initial rehabilitation and re-vegetation has occurred. Rehabilitation is a long-term process and the success will be a product of the planning and adherence to the designed final landform and measures initiated to ensure success.	N/A	Life of mine
		Recommended mitigation measures:		
		Active rehabilitation of degraded landscapes should commence.	N/A	Life of mine
		To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	As above	Life of mine
		Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas.	N/A	Life of mine
		When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas.	N/A	Life of mine
		Impacts will begin to subside and move towards a positive scale (ideally).	N/A	Life of mine
Demolition and removal of all infrastructures including transportation of site	The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase.	Good practises	Life of mine
		The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
		Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	As needed

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	state. Demolition and removal of all infrastructures will cause fugitive dust emissions. The impacts will be short-term and localised. Any implication or implications this phase will have on ambient air quality will seize once the activities are finalised.	Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Continually
		Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	N/A	Continually
		Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust.		Life of mine
		Dust suppression of roads being used during rehabilitation should be enforced.	N/A	Life of mine
Rehabilitation (Spreading of soil, re-vegetation and profiling / contouring)	During this activity, there is the reshaping and restructuring of the landscape. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option.	N/A	Life of mine
		Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion.	N/A	Life of mine
		Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings.	N/A	Life of mine
		The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
		Spreading of soil must be performed on less windy days.	N/A	Life of mine
		The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation.	N/A	Life of mine
		Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels.	N/A	Life of mine
		Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks.	N/A	Life of mine
		The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall.	N/A	Life of mine
		Speed restrictions should be imposed and enforced.	N/A	Life of mine
		Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	Life of mine

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
		Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Life of mine
		Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	N/A	Life of mine
		Hard surfaced haul roads or standing areas to be washed down and swept to remove accumulated dust.	N/A	Life of mine
		Dust suppression of roads being used during rehabilitation should be enforced.	N/A	Life of mine
		It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion.	N/A	Life of mine
		These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.	N/A	Life of mine
Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	No mitigation is required due to low significance of the impact.	As per Noise impacts identified	Not Applicable
Operation of the new TSF and WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	No mitigation is required due to low significance of the impact.	Not Applicable	Not Applicable
Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Complete design for storm water management before construction commence. Obtain a water use licence for the storm water management infrastructure. Keep the dirty storm water catchment area as small as possible for the infrastructure to be constructed. Ensure that the design of the storm water infrastructure complies with GN704 and other standards as required.	N/A	Planning to be done before commencement of activity Licenses to be obtained before commencement
Storm water management for the new	Spills from the storm water system may impact on surface water quality, habitat	The design of the storm water infrastructure will be compliant with GN704 and will be able to capture the	Promulgated regulations	Planning to be done before

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
TSF and associated infrastructure	and biota. Leachate from the storm water infrastructure if incorrectly lined / liner is damaged may impact on baseflow water quality.	1:50 year rainfall event. The water levels in the dam will be regulated to ensure that it is operated at the lowest water level possible to ensure that there is always capacity available to capture the 1:50 year rainfall event.		commencement of activity Licenses to be obtained before commencement
Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 55 dBA creating a potentially disturbing (noise levels exceeding 55 dBA higher than the acceptable sound level for daytime residential use).	No mitigation is required due to low significance of the impact.	N/A	N/A
Construction of the new TSF and the WRD expansion	Noise rating levels typical of an urban noise district where noise levels potentially could exceed 45 dBA creating a potentially disturbing (noise levels exceeding 45 dBA higher than the acceptable sound level for night time residential use).	No mitigation is required due to low significance of the impact.	N/A	N/A
Construction of the New TSF, TSF reclamation and WRD Expansion	Disturbance / Loss of the Soil Resource.	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed. Construction workers may not create new stockpiles without confirming that the location is correct. Constriction workers may not walk, drive or store any equipment or material on the stockpile area other than the approved material for stockpiling.	Compliance with EMPr recommendations and management measures	Life of mine
		The following recommendations are made with regards to soil stripping:		
		Strip the topsoil (where available) to depth of 50 to 60cm and stockpile at the closest allocated area for the stockpiles	N/A	As needed
		Use the latest freshly disturbed soils as rehabilitation material immediately on the area to be rehabilitated. In that way the effect of long fallow syndrome (loss of soil microbial activity and organic carbon) is negated	N/A	Continually
		The top soils must not be stockpiled higher than 6m (depending on texture) to alleviate natural compaction and the creation of anaerobic conditions in the topsoil.	N/A	Continually

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		The sub-soil can be stripped to a depth above the solid, unconsolidated material (calcrete layer), or weathered saprolite material. The sub-soil must be stripped and stockpiled separately from the top-soil.	N/A	Continually
		All stockpiles should also be protected to prevent erosion of stockpiled material and deflect water runoff. The duration of the stockpiles phase should be limited to a minimum period of time. Stockpiles should not exceed a maximum height of 6 m and it is recommended that the side slopes (should be stable at 1:3 gradient) and surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active. The top fertile 30-60 cm (if available) soil layer should be stockpiled separately and should be used for seeding and revegetation purposes. Site all soil stockpiles upslope from any mining / development activities.	N/A	Continually
		Erosion must be controlled in run-off areas especially in specific positions where donga erosion is present. During all new development care should be taken not to enhance erosion and it should be controlled as soon as erosion is observed. Surface areas should not be left bare for extended periods of time, but should always be vegetated or covered with suitable coverage to prevent dust formation.	N/A	Continually
		Traffic on unpaved roads should be limited, especially regarding heavy vehicles, but especially in erosion sensitive areas. Periods of rain, especially heavy rain, may cause erosion on roads in areas susceptible to erosion. Where erosion trenches are caused due to activities on unpaved roads the trenches should be rehabilitated.	N/A	Continually
		Berms should be constructed if necessary, to prevent storm water, contamination by dirty water and erosion, especially in the areas of the planned tailing dam sites.	N/A	Continually
		All land disturbed by the development should be vegetated and left in the condition it was before the construction or disturbance. None of the disturbed	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		areas should be left uncovered to prevent erosion and soil deterioration.		
		Water runoff must be controlled on the entire site to prevent any further disturbance of the site. Early management to prevent water runoff is needed. Special attention should be given to the entire TWF 1 combined site in terms of surface water management and remediation.	As per surface water impacts identified	As per surface water impacts identified
		It is recommended to restrict the number of roads, and limit the number of passes on the roads in construction areas to control the possibility of compaction by heavy vehicles and erosion, If necessary, special measurements should be taken to control dust, especially on unpaved roads.	As per Air quality impacts identified	As per Air quality impacts identified
		Seepage may occur in the new development areas and should be controlled as soon as it is observed. High priority should be given to this possible problem. As far as possible topsoil stockpiles should be used within 1 year.	As per groundwater impacts identified	As per groundwater impacts identified
		Contamination of presently undisturbed top soils should be prevented as far as possible. Since large areas on this site have already been disturbed all waste products should be dumped on previously disturbed sites of the prospecting rights areas, even though the soils on this site are of low potential.	As per groundwater impacts identified	As per groundwater impacts identified
Ineffective housekeeping and management of stockpiles and exposed soils as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss of the Soil due to erosion as well as contamination	As above.	Compliance with EMPr recommendations and management measures	Life of mine
Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Cumulative disturbance, loss and degradation of soils	As above.	Compliance with EMPr recommendations and management measures	Life of mine

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
Continuation of other activates inclusive of mining and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Increased / Decreased sediment loads on downstream systems	As above.	Compliance with EMPr recommendations and management measures	Life of mine
Stripping of soils, Clearing of vegetation and stockpiling of materials as a result of TSF construction, TSF reclamation and WRD expansion	Disturbance / Loss / Sterilization of inherent land capability and land use.	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed.	Compliance with EMPr recommendations and management measures	Life of mine
		The following recommendations are made with regards to soil stripping:		
		Strip the topsoil (where available) to depth of 50 to 60cm and stockpile at the closest allocated area for the stockpiles	As above	As above
		Use the latest freshly disturbed soils as rehabilitation material immediately on the area to be rehabilitated. In that way the effect of long fallow syndrome (loss of soil microbial activity and organic carbon) is negated	As above	As above
		The top soils must not be stockpiled higher than 6m (depending on texture) to alleviate natural compaction and the creation of anaerobic conditions in the topsoil.	As above	As above
		The sub-soil can be stripped to a depth above the solid, unconsolidated material (calcrete layer), or weathered saprolite material. The sub-soil must be stripped and stockpiled separately from the top-soil.	As above	As above
		All stockpiles should also be protected to prevent erosion of stockpiled material and deflect water runoff. The duration of the stockpiles phase should be limited to a minimum period of time. Stockpiles should not exceed a maximum height of 6 m and it is recommended that the side slopes and surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active. The top fertile 30-60 cm (if available) soil layer should be stockpiled separately and should be used for seeding and revegetation purposes. Site all soil stockpiles upslope from any mining / development activities.	As above	As above

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Erosion must be controlled in run-off areas especially in specific positions where donga erosion is present. During all new development care should be taken not to enhance erosion and it should be controlled as soon as erosion is observed. Surface areas should not be left bare for extended periods of time, but should always be vegetated or covered with suitable coverage to prevent dust formation.	As above	As above
		Traffic on unpaved roads should be limited and speed limits should be implemented, especially regarding heavy vehicles, but especially in erosion sensitive areas. Periods of rain, especially heavy rain, may cause erosion on roads in areas susceptible to erosion. Where erosion trenches are caused due to activities on unpaved roads the trenches should be rehabilitated.	As above	As above
		Berms should be constructed if necessary, to prevent storm water, contamination by dirty water and erosion, especially in the areas of the planned tailing dam sites.	As above	As above
		All land disturbed by the development should be vegetated and left in the condition it was before the construction or disturbance. None of the disturbed areas should be left uncovered to prevent erosion and soil deterioration.	As above	As above
		Water runoff must be controlled on the entire site to prevent any further disturbance of the site. Early management to prevent water runoff is needed. Special attention should be given to the entire TWF 1 combined site in terms of surface water management and remediation.	As above	As above
		It is recommended to restrict the number of roads, and limit the number of passes on the roads in construction areas to control the possibility of compaction by heavy vehicles and erosion, If necessary, special measurements should be taken to control dust (e.g. mixture of water and hygroscoping material, speed limits), especially on unpaved roads.	As above	As above

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Seepage may occur in the new development areas and should be controlled as soon as it is observed. High priority should be given to this possible problem.	As above	As above
		Contamination of presently undisturbed top soils should be prevented as far as possible. Since large areas on this site have already been disturbed all waste products should be dumped on previously disturbed sites of the prospecting rights areas, even though the soils on this site are of low potential.	As above	As above
Continued clearing, disturbance, laydown, stockpiling and transportation as a result of TSF construction, TSF reclamation and WRD expansion	Loss of land services, ecosystems support and services	As above.	Compliance with EMPr recommendations and management measures	Life of mine
Access road and stream diversion construction activities	Disturbance / loss of soil resources	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed.	Compliance with EMPr recommendations and management measures	Life of mine
		The recommendations regarding soil stripping are the same as above.	As above	As above
Ineffective housekeeping and management of stockpiles and exposed soils as a result of the Access road and stream diversion	Disturbance / loss of soil due to erosion as well as contamination	As above	Compliance with EMPr recommendations and management measures	Life of mine
Continued activities inclusive of mining and transportation as a result of the access road and stream diversion	Cumulative Disturbance / loss and degradation of soils	As above	Compliance with EMPr recommendations and management measures	Life of mine
Continued activities inclusive of mining and transportation as a result of the Access road and stream diversion	Increased / decreased sediment loads on downstream systems	As above	Compliance with EMPr recommendations and management measures	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
Stripping of soils, clearing of vegetation and stockpiling of materials for road and river diversion	Disturbance / loss / sterilisation of inherent land capability and land use	In case of any new development, all usable soil (where present) should be stockpiled and used for rehabilitation. Vegetation of these stockpiles will be needed.	Compliance with EMPr recommendations and management measures	Life of mine
		The following recommendations are made with regards to soil stripping:		
		Strip the topsoil (where available) to depth of 50 to 60cm and stockpile at the closest allocated area for the stockpiles	As above	As above
		Use the latest freshly disturbed soils as rehabilitation material immediately on the area to be rehabilitated. In that way the effect of long fallow syndrome (loss of soil microbial activity and organic carbon) is negated	As above	As above
		The top soils must not be stockpiled higher than 6m (depending on texture) to alleviate natural compaction and the creation of anaerobic conditions in the topsoil.	As above	As above
		The sub-soil can be stripped to a depth above the solid, unconsolidated material (calcrete layer), or weathered saprolite material. The sub-soil must be stripped and stockpiled separately from the top-soil.	As above	As above
		All stockpiles should also be protected to prevent erosion of stockpiled material and deflect water runoff. The duration of the stockpiles phase should be limited to a minimum period of time. Stockpiles should not exceed a maximum height of 6 m and it is recommended that the side slopes and surface areas be vegetated in order to prevent water and wind erosion and to keep the soils biologically active. The top fertile 30-60 cm (if available) soil layer should be stockpiled separately and should be used for seeding and revegetation purposes. Site all soil stockpiles upslope from any mining / development activities.	As above	As above
		Erosion must be controlled in run-off areas especially in specific positions where donga erosion is present. During all new development care should be taken not to enhance erosion and it should be controlled as soon as erosion is observed. Surface areas should not be left bare for extended periods of time, but should always be vegetated or covered with suitable coverage to prevent dust formation.	As above	As above

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Traffic on unpaved roads should be limited, especially regarding heavy vehicles, but especially in erosion sensitive areas. Periods of rain, especially heavy rain, may cause erosion on roads in areas susceptible to erosion. Where erosion trenches are caused due to activities on unpaved roads the trenches should be rehabilitated.	As above	As above
		Berms should be constructed if necessary, to prevent storm water, contamination by dirty water and erosion, especially in the areas of the planned tailing dam sites.	As above	As above
		All land disturbed by the development should be vegetated and left in the condition it was before the construction or disturbance. None of the disturbed areas should be left uncovered to prevent erosion and soil deterioration.	As above	As above
		Water runoff must be controlled on the entire site to prevent any further disturbance of the site. Early management to prevent water runoff is needed. Special attention should be given to the entire TWF 1 combined site in terms of surface water management and remediation.	As above	As above
		It is recommended to restrict the number of roads, and limit the number of passes on the roads in construction areas to control the possibility of compaction by heavy vehicles and erosion, If necessary, special measurements should be taken to control dust, especially on unpaved roads.	As above	As above
		Seepage may occur in the new development areas and should be controlled as soon as it is observed. High priority should be given to this possible problem.	As above	As above
		Contamination of presently undisturbed top soils should be prevented as far as possible. Since large areas on this site have already been disturbed all waste products should be dumped on previously disturbed sites of the prospecting rights areas, even though the soils on this site are of low potential.	As above	As above
Continued clearing, disturbance, lay down, stockpiling and	Cumulative Disturbance / loss / sterilisation of inherent land capability and land use	As above	Compliance with EMPr recommendations and management measures	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
transportation for road and river diversion				
Vegetation removal	Vegetation removal (though already disturbed footprint area) could result in siltation of the watercourse should this activity occur during the rainfall season. As a result of the vegetation removal, the existing flow regime and micro habitats created by the existing diversion would be altered.	Finalise design and site layout plan before construction commence.	Compliance with EMPr recommendations and management measures	Life of mine
		Delineate area to be cleared using suitable material	N/A	Before construction commence
		Commence and finalise vegetation clearance during the dry season.	N/A	As needed
		Construct storm water management infrastructure as soon as possible before bigger area is cleared of vegetation to allow for any run-off to be captured in the dirty storm water containment facilities before clearance of TSF area begins.	N/A	Before operation of TSF commence
Vegetation removal	The potential for hydrocarbon spills from machinery working within 100 m from a watercourse is a possibility.	No vehicles to overnight at the construction area.	Compliance with EMPr recommendations and management measures	Life of mine
		Machinery to overnight in dedicated area near workshop.	N/A	Life of mine
		Clear any spills as soon as possible by removing the affected soils and disposing to suitable hazardous waste bin for removal by appointed waste contractor.	N/A	As needed
Diversion of the unnamed tributary around the new TSF and associated infrastructure	It is recommended that a formal river diversion be designed around the new footprint area of the TSF and associated infrastructure. This will have a positive impact on the flow regime, habitat, water quality and biota of the watercourse and allow for the connection of the upstream and downstream area.	Design the diversion infrastructure before commencement of activity.	Compliance with EMPr recommendations and management measures. Ensure that licences are in place for water use activities.	Life of mine
		Obtain Water use licence for the proposed diversion before commencement of activity.	As per licence conditions	Before construction commence
		Delineate diversion clearly and keep construction to the approved footprint area.	As per licence conditions	Before construction commence
		Construct diversion channel in the dry season.	As per licence conditions	Once off

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
		Seed the constructed banks with indigenous seed mix and wet as needed to ensure vegetation growth. Assess successful vegetation establishment 3 months after first seeding and re-seed areas with poor vegetation establishment.	As per identified fauna and flora impacts	As per identified fauna and flora impacts
		Conduct annual inspections on vegetation establishment and bank stability of the diversion. Implement rehabilitation measures as needed to ensure that banks do not erode and result in siltation of the watercourse.	As per identified fauna and flora impacts	As per identified fauna and flora impacts
Diversion of the unnamed tributary around the new TSF and associated infrastructure	Negative aspects associated with the construction of the proposed diversion may include siltation and temporary impacts on flow regime, habitat and biota.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Diversion of the unnamed tributary around the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Storm water management for the new TSF and associated infrastructure	The proposed storm water management system will impact on the flow regime of the watercourse by containing dirty water from the TSF and associated infrastructure.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Storm water management for the new TSF and associated infrastructure	The potential for hydrocarbon spills from machinery working within the watercourse diversion is a possibility.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Construction of the TSF and associated infrastructure liner system	During construction of the TSF and associated infrastructure impacts on water quality due to siltation as a result of the loosening of material may occur. The potential impacts on the surface water quality could impact on the habitat and biota of affected watercourses.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Construction of the TSF and associated infrastructure liner system	Spills from the storm water system may impact on surface water quality, habitat and biota. Leachate from the storm water infrastructure if incorrectly lined /	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
	liner is damaged may impact on baseflow water quality.			
Operation of the TSF and associated infrastructure	No additional impacts on the flow regime is expected as it is covered in the storm water management required for the site. During the operational phase leachate from the TSF and associated infrastructure if the incorrect liner is installed or of the liner is damaged may impact on the baseflow water quality.	Complete the design for the TSF before construction commence. Design of the TSF and liner system will be approved by the DWS before commencement of construction. Liner system to be constructed under the supervision of an Engineer. Ensure that there are upstream and downstream monitoring boreholes available to monitor potential leachate from the TSF.	Compliance with EMPr recommendations and management measures	Life of mine
Operation of the TSF and associated infrastructure	Spills from the pipeline would result in impacts on the water quality (should the tributary be flowing at the time). If spills are not cleaned it could result in base flow water quality impacts. This in turn could impact on the habitat and the biota.	Inspect the pipeline on a daily basis and repair any areas immediately. Remove any spilled material immediately and dispose to the TSF.	Compliance with EMPr recommendations and management measures	Life of mine
Operation of the TSF and associated infrastructure	TSF breaching could result in impacts on water quality, habitat and Biota should a break occur on the east, south or western sides of the TSF. The potential range of the impact has been modelled by Tailings solutions.	Comply with the operational guideline for tailings deposition to ensure that dam wall integrity is not compromised.	Comply with the operational guideline for tailings deposition to ensure that dam wall integrity is not compromised.	Life of mine
Backfilling of the historic pit area with Tailings	No liner is possible in the pit thus it will not be possible to reduce leachate to the baseflow of the watercourse. This will have an impact on the baseflow water quality of the watercourse and have a negative impact on the water quality in the Dwars river. Please also refer to the geohydrological assessment.	Ensure that the are upstream and downstream monitoring boreholes available to quantity the impact from the backfilling of the pit with tailings.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The increase in soil to act as a capping material may result in wind-blown dust and potential siltation that could impact on biota and the habitat. The vegetation of the TSF and associated infrastructure is a positive aspect.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
		Implement the approved rehabilitation plan. It is recommended that the rehabilitated TSF be inspected annually for at least 5 years post closure to identify any problems. Should any problems be identified,	As per Closure plan	After closure

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		amend rehabilitation plan to address the areas and implement.		
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	During the closure phase the movement of machinery may result in hydrocarbon spills that could impact on water quality, biota, habitat and vegetation.	Refer to measures under Vegetation Clearance.	Compliance with EMPr recommendations and management measures	Life of mine
Capping and rehabilitation of the TSF and associated infrastructure as per an approved plan	The potential of leachate generated by the TSF and associated infrastructure is still a possibility and could result on impacts on quality, biota and vegetation.	Monitor the upstream and downstream monitoring boreholes for at least 5 years post closure to quantity the impact and update the geohydrological model.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Re-mining of TSF facilities	Pumping of mobilised fines across the diverted tributary could impact on water quality, habitat and biota should a spill occur.	Inspect the pipeline on a daily basis and repair any areas immediately.	Compliance with EMPr recommendations and management measures	Life of mine
		Remove any spilled material immediately and dispose to the TSF.	N/A	As needed
Re-mining of TSF facilities	Should the liner system be compromised as a result of the re-mining this could impact on the surface water quality, habitat and biota.	Keep at least 0.5 m of tailings above the liner system to prevent damaging the liner system.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
		Use hydro-mining methods and not mechanical methods to reduce the possibility of damaging the liner system.	N/A	Life of mine
		Monitor upstream and downstream boreholes.	As per groundwater impacts identified	As per groundwater impacts identified
Construction of the new TSF and the WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	The visual impact can be minimized creating visual barriers.	Compliance with EMPr recommendations and management measures	Life of mine
		The construction area will be cleared as soon as construction of the infrastructure is finished.	N/A	Life of mine
Permanent nature of the new TSF and WRD expansion	Potential visual impact on the viewpoints that had a visual exposure rating.	The visual impact can be minimized by the creation of visual barriers.	Compliance with EMPr recommendations and management measures	Life of mine
		Planting indigenous vegetation.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Clearing only vegetation as required.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
		Rehabilitating any disturbed areas as soon as possible.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
New TSF (TWF1 or TWF3 options)	Pollution Plume	The TSF should be lined with the appropriate liner material as dictated by the waste classification of the tailing's material.	Compliance with EMPr recommendations and management measures	Life of mine
		A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the TSF is diverted clear of the deposit	As per surface water impacts identified	As per surface water impacts identified
Existing TSF	Pollution Plume	An extended hydrocensus (2 km radius) must be conducted every 5 years in the area that could be impacted, to update the groundwater status and to provide proof that the mine does not impact on the groundwater.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
		Monitor groundwater users that could be affected an on annual basis (minimum) to establish a baseline against which impacts can be compared and to protect the mine against unwarranted claims.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
		Water in the Dwars River must be monitored on a monthly basis upstream and downstream of the mining area.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
		Groundwater model must be updated on a 5-yearly interval to incorporate latest groundwater measurements and future mining plans.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
		Additional groundwater monitoring boreholes (sited using geophysical methods and supervised by qualified hydrogeologist) should be drilled and added to current monitoring network before the proposed TWF1 or TWF3, extension of the waste rock dump and planned underground is operational. These should be monitored on a monthly basis prior to	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		construction, during and operational for the identified parameters.		
		The aquifer parameters should be measured by conducting an aquifer test (pump test, slug test etc.) on each of the newly drilled boreholes. 24-Hour pumping tests are recommended. This information can be used to update the numerical with accurately measured parameters	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
		General groundwater management as prescribed for all phase of the mine development.	EMPr compliance	Life of mine
WRD	Pollution Plume	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground Mine - planned, inclusive of surface facilities	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground mine - Existing	Pollution plume may result in an increase of 100 - 500 mg/l sulphate. No decant is expected	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground Mine - planned	Dewatering could result in < 1 m water level decline	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Underground mine - Existing	Dewatering could result in < 1 m water level decline	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Cumulative of all activities	Pollution Plume	As above	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
TWF1 option	Potential impact on artefacts.	Conduct detailed mapping of the TWF1 area and the related erosion donga in order to determine the extent of the archaeological deposit and sites located here. Collect samples / excavation of surface features of material dating to the Stone Age and Iron Age once approval is received from SAHRA.	SANS Permit	Before construction begins
Movement of trucks, excavators and other mining equipment.	Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active. The noise levels will increase to 90 - 100 dBA during day time (5h00 – 19h00). Rock breakers and blasting for the excavation during mining operations will generate noise levels of 100 – above 120 dBA respectively. The closest village (Mahlagari) to Tweefontein is 8 km away and less likely to be impacted due to it being further away from the site. Noise rating for activities similar to that proposed at Tweefontein mine vary between 50 dB (A) and 57.8 dB (A).	Measures such as ensuring all vehicles and equipment are in good working order, and that any faulty exhaust- and/or intake silencers are replaced timorously, will reduce the severity and significance of the impact.	As per Noise impacts identified	As per Noise impacts identified
		Drilling and blasting is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. A complete blasting schedule and timeframes must be compiled and communicated with the adjacent communities to ensure that they are notified in advance prior to blasting taking place	SANS Blasting	Right before and during blasting
		Personnel working within the plant must wear ear protection gear. Operators must wear ear protection at all times when operating the earth moving equipment and machinery to prevent noise induced hearing loss.	Mine Health and Safety standards	Life of mine
		Noise pollution must be monitored monthly, and recorded throughout the life of mine.	As per Noise impacts identified	As per Noise impacts identified
Cumulative of all activities	The noise impacts of the proposed Tweefontein Project and exiting Mahlagari village (08km) and retail/commercial activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	As above	As above	As above
Movement of trucks, excavators and other mining equipment, including mining activities	Controlled movement of haul trucks and light delivery vehicles (LDVs) around the site will generate some nuisance dust into the atmosphere. Dust will also be generated from the opencast pits,	Wetting of the access roads with water periodically to suppress the dust will greatly reduce the impact of dust. This wetting with water must be done daily during dry and windy seasons.	As per Air quality impacts identified	As per Air quality impacts identified
		Dust and smoke monitoring will be conducted during the life of mine to determine the prominent wind	As per Air quality impacts identified	As per Air quality impacts identified

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	access roads to and from the open pits and crusher/plant sites.	directions and dust / smoke levels at various points around the mining site.		
		In term of the requirements of the Mine Health and Safety Act, 1996 SECM must provide protective clothing and equipment for all its employees, and must periodically conduct risk assessments to analyse and monitor the effects of dust and smoke on the staff members and the surrounding environment.	Mine Health and Safety standards	Life of mine
		Concurrent rehabilitation and re-vegetation of the project sites will also reduce surfaces that are exposed to wind generated dust.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
All	Cumulative impact on air quality	As above	As above	As above
All	Visual impact will result from the visual contrast of the site with the surrounding areas due to the following factors: § The crushing and screening activities create a high visual contrast with the surrounding areas, which are greener and less uniform. In the first phase of rehabilitation, trees and natural vegetation will be used to disguise or buffer the mine workings as far as possible and provide some degree of stabilization of the substrate; § The position of the mine workings, tailings storage facility and waste rock dump above the R555 Road, which raises it above the level of any naturally occurring tree, making it more visible; § The relatively undeveloped nature of the surrounding area immediately reveals the presence of man-made infrastructure and man-made forms (straight lines, bold colours etc.) The proposed SECM Tweefontein opencast activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the	Concurrent rehabilitation should be implemented throughout the life of the mine to minimize and return the environment to - as much as possible – the original status. Screening with vegetation (trees) should also be implemented to mask the mine and the other mine infrastructure from various settlement viewpoints and soften the visual impacts.	As per Ecological and Visual impacts identified	As per Ecological and Visual impacts identified
		The visual impact of the Tweefontein opencast pits, residue dumps and surface infrastructure sites can be reduced by doing the following: § Filling up the mining site to match the surrounding landscape as closely as possible in the final phase of rehabilitation; § Planting trees on the available fill material at a high density in the first phase of rehabilitation to match the “texture” of the surrounding landscape; § Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e.. grey vs reddish brown).	As per visual impacts identified	As per visual impacts identified
		To reduce the impact of the cutting on the topography and restore the landscape character to closely resemble the conditions prior to the opencast pits, the following is recommended: § Studying the contour map of the site and mimicking the surrounding areas on the final earthworks plan as closely as possible without excessive cost as part of the final phase of rehabilitation;	As per visual impacts identified	As per visual impacts identified

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	mining operation. The mine will be visible from R555 main road.	§ Stabilising the substrate/backfill material by means of a variety of metal-tolerant grasses, shrubs and trees; § Screening the road as far as possible with indigenous trees, grasses and shrubs.		
All	The proposed additional mining infrastructure at Tweefontein Mine may form part of the "sense of place" in the long term, even after operations cease.	As above	As above	As above
All	The construction and expansion of the Tweefontein mine surface infrastructure including crushing and screening plant, tailings dam, waste rock dumps, access roads and opencast pits will require topsoil stripping and clearing of vegetation. The inherent land capability will be permanently lost below the footprint of these mining entities. The severity of the impact is considered to be of moderate to high significance. The reason for the moderate severity is that the land is zoned for mining and currently being mined by SECM. The proposed opencast pits and mining infrastructure will not alter the land use at the mine footprint due to current mining activities at the Tweefontein mine. The additional mining infrastructure will add to the existing impacts of air pollution due to dust, visual impacts, and extraction of water for mining purposes due the existing mining operations. There is no major impact on the land use since the area is already zoned for mining. The positive impact of mining in the project area include increased business opportunities, greater demand for goods and services, pressures for housing (ability to own houses), etc.	Rehabilitate the land to as close as possible to its wilderness and grazing land state during and after the mining activities are concluded. Re-vegetation should be with indigenous plant species that are able to sustain the regional climate and soil conditions.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
		The farm where the current mining activities are taking place, is already a restricted/controlled access, therefore the larger SECM Tweefontein mining proposed activities will not reduce availability of natural resources and land to local communities.	N/A	N/A

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
All	Cumulative impacts on land use due to secondary industries that may be developed around the areas to provide support services and material to the mine. Urbanization and modern residential developments also likely.	As above	As above	As above
TSF and WRD development	Three (3) archaeological sites were identified in the TSF1 area during the September 2020 (A. Pelser) fieldwork, dating to the Stone- and Iron Age periods, but there is a high likelihood that more are located in the TSF1 area and in the expansive erosion donga that is partially situated within the area and bordering the area. It is therefore important that the TSF1 area be studied in more detail as part of Phase 2 Archaeological Mitigation before mining activities commence. TSF1 is not the preferred site for the proposed tailings facility and therefore the said three sites will not be impacted on.	All Archaeological, palaeontological and heritage sites and resources must be preserved if they are of cultural, historic or pre-historic significance. This must be done in conjunction with an expert or competent person.	Applicable permits in place if needed	As per Heritage assessment findings
		Monitoring for chance finds (e.g. burial sites, old waste disposal sites, ruins, foundations etc.) must be done continuously during operations. If any old graves are encountered, these must be demarcated, documented and fenced-off if preservation is the option taken. However, if preservation is not feasible, the identified graves must be relocated to another suitable site. Thus must be done by an accredited archaeologist through a Section 36 SAHRA permit application.	N/A	As needed
		Findings, if encountered during mining activities, must be reported to the LIHRA Office, Limpopo and Fetakgomo Tubatse Municipality who will decide, after consultation with other relevant authorities, company representatives and local communities whether work may go ahead. Special precautions may be instituted to enable the mining work to proceed.	N/A	As needed
		Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist.	N/A	As needed
		Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in	N/A	As needed

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		order to verify the presence or absence of any such material.		
		Any graves in the vicinity of the mining operations will or not be directly affected must be documented and monitored for damage.	N/A	As needed
All	Any further mining development will form part of the history of the local area. No other cumulative impacts are anticipated.	As above	As above	As above
All	Crime is commonly in most settlement areas and the community of Mahlagari is not different. However, due to the rural nature of the settlements, crime may be lower comparative to urban centres such as Burgersfort. The traditional livelihoods and sharing of communal resources in rural settlements also minimizes crime to some extent. Crime and HIV statistics in Mahlagari village have NOT been verified in this SEA study, however as a general norm influx of foreign people and job seekers in communities adjacent to large scale projects such as the Tweefontein mine project is inherent. HIV and crimes such as theft, sex crimes, traffic violations, fraud and drugs are possible, and likely to increase if not managed and policed because of the Tweefontein mine project. Influx of foreigners and job seekers and increase in disposable income for local people may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Labour should be sort from the local settlement areas to prevent influx of foreigners who are likely to disrupt the social fabric, values and norms of the village people.	None Applicable	Continually
		Through the SLP and day-to-day training and awareness programmes pandemics such as HIV can be managed and minimized. The Tweefontein mine must also have an HIV awareness outreach programme in conjunction with local health centres and clinics to extend awareness and knowledge about the disease to the broader communities affected by the proposed mine activities.	Existing policies	Life of mine
		Visible policing and community policing forums must be established to curb incidents of crime in the communities. This option must be implemented in conjunction with existing tribal authority processes to manage crime and illegal activities.	N/A	Life of mine
All	Cumulative impact on Crime, Covid-19 and HIW	As Above	As Above	As Above
All	Mahlagari village is a village in Steelpoort and the closet and most likely to be affected by to the Tweefontein	Promotion of chrome beneficiation within the Limpopo to improve the quality and value of the product being mined, and create further economic activity.	As Above	As Above

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
	mine project. It is characterized by rural to semi-rural settlements with high levels of poverty and high unemployment levels as well as low literacy levels. The region's economy is derived from a variety of sectors, of which mining and agriculture are the main contributors.	Samancor Chrome Limited already has chrome concentrator plants in the Steelpoort valley. Subject to economic modelling and feasibility study, another concentrator plant in the vicinity of Tweefontein can further stimulate significantly the economic activity in Fetakgomo Municipality, Lebowakgomo and the surrounding region.		
	A high percentage of residents in the local village of Mahlagari are unemployed. The mine will alleviate this unemployment problem, though it will not eradicate it completely. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The life of mine (LOM) is expected to be over 20 years, which translate to 20 years and more of economic activity in the region. The social and labour plan (SLP) to be implemented by the SECM Tweefontein Project will contribute to the development of the adjacent community in terms of skills training, local economic development projects, and improved infrastructure.	Labour should be sort from the local settlement areas to prevent influx of foreign people and job seekers who are likely to disrupt the social fabric, values and norms of the village people.	Existing policies	Life of mine
All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation. - Crime impacts	As Above	As Above	As Above
All	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community.	As Above	As Above	As Above

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
	Improved way of life due to job creation. - Employment impacts			
TSF Operation	Potential loss of resource and life should TSF dam failure occur on northern wall	As per TSF failure under Surface water	As per TSF failure under Surface water	As per TSF failure under Surface water
Opencast mining and Underground mining areas	Loss of chrome resource	No mitigation is possible as there is no way that the resource could be replaced	N/A	Duration of mining
Opencast mining areas	Voids left as a result of chrome removal at Opencast areas	Backfill voids	N/A	When mining is finished
		Rehabilitate disturbances caused by geological exploration	N/A	Immediately
		Level trenches and boreholes and cover with topsoil	N/A	When not in use any more
		Seed and vegetate area disturbed by exploration	N/A	Immediately
		Should erosion occur suitable alternatives such as mulching and shelter beds for wind erosions should be investigated	N/A	Immediately
All	Impact on pre-mining and operational topography	The hard and soft material placed in mined out areas must be profiled in keeping with the adjacent un-mined areas	N/A	When mining is finished
		At the contact between the pit and the un-mined land the slope of the ground must not exceed 5%	N/A	When mining is finished
		Shape the topography so that it is free draining and reshape areas of arable land capability so that it does not have a slope greater than 4%.	N/A	When mining is finished
		Replace topsoil to achieve required pre-mining land capability	N/A	When mining is finished
		Re-vegetate rehabilitated areas	N/A	Immediately
All	Loss of topsoil during stripping, handling and placement on rehabilitated areas	Strip all usable soil ahead of mining and related activities. This should comprise the entire A-horizon and the majority of the B-horizon material, until 10 percent (10 %) mottling is evident in sub-soils. Soil should be stripped during low rainfall conditions.	N/A	Before construction start
		Within the footprint of the opencast area, extra care will need to be taken to recover all usable topsoil; Topsoil must be stripped from the cleared sites as for undisturbed areas.	N/A	Before construction start

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Where possible replace stripped soil directly in mined out areas where profiling and final shaping have been completed.	N/A	During rehabilitation
		Where soil must be stockpiled, site the topsoil stockpiles up slope or next to, but not down slope of, the mining operation so as to minimise the risk of topsoil contamination.	N/A	Continuous
		All topsoil stockpiles to be protected from erosion by a development of an earth deflection bund upslope of the stockpile.	N/A	Continuous
		If soil stockpiles are going to be left for more than 12 months, vegetate soil stockpiles to minimise soil loss to wind and water erosion. Vegetation to comprise seeding with commercially available pasture grasses.	N/A	Continuous
		Construct surface water control berms on the contour to manage storm water runoff onto rehabilitated sites until such time as the re-established vegetation community has stabilised.	N/A	During rehabilitation
		Establish surface water control berms along the contour on rehabilitated land to control the flow of surface water across rehabilitated land.	N/A	During rehabilitation
		Re-establish drainage lines at a drainage density equal to or greater than the pre-mining drainage density.	N/A	During rehabilitation
		Re-vegetate placed topsoil areas as soon as possible after placement in order to minimise soil loss to wind and water erosion	N/A	Continuous
All	Loss of topsoil fertility as a result of changes to the physical, chemical and biological soil properties which could affect the potential land use	Where possible, place stripped topsoil directly onto profiled and shaped areas to minimise the volume of soil that needs to be stockpiled.	N/A	During rehabilitation
		Prior to planting or seeding, conduct routine fertility analysis and fertilise accordingly to create growing conditions that are suitable for plant growth.	N/A	Continuous
All	Contamination of soils by fuels and lubricants from mining and associated equipment	Clean affected area immediately and place contaminated soil in special bin.	N/A	Immediately
		Service vehicles regularly and keep vehicles in a dedicated area when not in use.	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Place drip trays under vehicles and remove contaminated material to an approved waste landfill site.	N/A	Continuous
All	Change of land use from wilderness to mining and back to wilderness	Reinstate land capability classes with the exception of the area where shallow soils depths occur resulting in classification of the area as having a wilderness land capability. These areas to be returned to wilderness land capability by return of more than 300 mm soil to the profiled spoils.	Compliance with Closure plan	During rehabilitation
		Re-establish surface drainage and a free draining landform	Compliance with Closure plan	During rehabilitation
		Implement soil protection and conditioning measures	Compliance with Closure plan	Continuous
		ECM to conduct monitoring of rehabilitated areas to assess performance of the rehabilitation approach employed. Rehabilitated areas should be monitored annually to identify: (1) occurrence of surface erosion, (2) vegetation die back, (3) salinization of the soil surface, (4) fertility status of rehabilitated land, (5) the emergence of alien/exotic vegetation	N/A	Annually
		In the event that non-performance is identified, the ECO will implement a plan for corrective action, and will seek the advice of rehabilitation ecologists as required	N/A	As needed
All	Impact on wilderness land used for mining activities	Make rehabilitated land areas of wilderness potential available for controlled use as soon as possible in order to facilitate the reintegration of these areas into the regional framework.	N/A	As soon as possible
Opencast mining and Underground mining areas	Management of un-mined land at Tweefontein	The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated.	N/A	Continuous
		Burning of fire breaks around veld areas should be carried out in agreement with neighbouring communities or land owners and permits to burn obtained prior to undertaking activity	N/A	When needed
All	Loss of rare plant species that occur on site	Avoid areas where rare plant species occur	EMPr compliance	Continuous
		Relocate rare plant species when needed, e.g. aloes, succulents and woody species	Permits for relocation in place	When needed

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
All	Growth of alien invasive plant species on site	Inspect all land areas under ECM control annually, at the start of the summer period.	N/A	Annually
		Map areas of exotic vegetation, should such vegetation develop on the areas of the site outside of the mine pit footprint. Classify areas of infestation as areas of heavy, medium or light infestation. Define the perimeters of these areas and manage as follows: (1) Fix the perimeter of each area. (2) Actively eradicate any new exotic vegetation outside of the heavily infested areas. (3) Starting with the areas of light infestation, actively eradicate the exotic vegetation from within the identified areas.	N/A	Annually
		Maintain an active follow up programme in cleared areas to control re-growth and seedling establishment and thereby prevent re-infestation of the cleared areas.	N/A	Annually
		Keep rehabilitated land clear of alien vegetation through regular inspection and clearing of young plants.	N/A	Annually
All	Loss of species diversity and habitat characteristics due to mining	To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining.	N/A	When area becomes available for rehabilitation
		Preparation of rehabilitated land areas for revegetation.	N/A	When area becomes available for rehabilitation
		Sow the prepared areas with a seed mixture which will produce a grass cover at various levels and over as much of the growing season as possible. The seed mix should consists of the following: (1) Eragrostis tef (teff) 1 - 2 kg/ha (2) Medicago sative (Lucerne) 1 - 2 kg/ha (3) Cynodon dactylon (couch grass) 2 - 4 kg/ha (4) Chloris gayana (Rhodes grass) 4 - 6 kg/ha (5) Digitaria eriantha (Smuts finger grass) 4 - 6 kg/ha.	N/A	When area becomes available for rehabilitation
		Include other native grass seed in the mixture applied when such seed is available.	N/A	When area becomes available for rehabilitation
		Include successive rehabilitated areas of the Tweefontein opencast into an annual land monitoring programme.	N/A	Annually

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Appoint an ecologist to carry out vegetation monitoring at regular intervals (two years) within each area that has been re-vegetated to establish the progression towards self-sustainability in re-vegetated areas.	N/A	Every 2 years
		Monitoring should include assessment of the following: (1) species abundance and basal cover (2) an estimation of biomass yield (3) index of plant species diversity within the rehabilitated plant community.	N/A	Every 2 years
All	Loss of indigenous animals	Manage the development of the mining window in such a manner that the footprint of disturbance is minimised. This will include the maintenance of natural corridors to allow for the movement of animals.	N/A	Continuous
		Do not allow hunting or trapping of game or birds on the site.	N/A	Continuous
		Ensure that environmental education of mine staff takes place at all levels to limit unnecessary damage to habitats and/or disturbance of fauna. Develop environmental module to form part of site induction programme. All contractors and staff to attend induction.	N/A	Continuous
All	Reduction in surface water quantity (volume of water to the receiving environment)	Seal against the loss of water from the beds of the river	N/A	Continuous
		Develop a mining layout with sufficient walls to prevent subsidence	N/A	Continuous
		Should ingress occur, collect seepage in the highest mining level and pump out as soon as possible	N/A	When needed
		If the water collected is contaminated implement treatment measures before release	N/A	When needed
		Return post mining topography to as close as possible to pre-mining situation	N/A	During rehabilitation
		Return the surface water drainage pattern to as close as possible to pre-mining situation	N/A	During rehabilitation
		Design culverts and bridges so that the flood times and water retention times do not impact on mining infrastructure	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Implement storm water management to divert clean water around the mining area to ensure that the dirty footprint is kept to a minimum	N/A	Continuous
		Contain all contaminated water in a dedicated design facility to adhere to legislation and to contain a 1:50 year storm event and have a 0.8m freeboard	N/A	Continuous
		Ensure that all hazardous substances (Oils etc.) are stored in an appropriate facility (Bund walls / roofs)	Good practises Municipal bylaws	Continuous
		Implement a rehabilitation strategy for the stream diversions at Klarinet	N/A	During rehabilitation
		Quantitative and qualitative assessment of the water resources on the mining property to effectively conduct Integrated Water Resource Management	N/A	Continuous
		Optimise water use by means of waste water minimisation, and increasing the reuse and recycling of waste water	N/A	Continuous
		Effective and efficient use of the existing available water resources in all water use sectors within the mine (WCDM)	N/A	Continuous
		Regular maintenance of surface water management infrastructure to be done in order to prevent silt build up	N/A	Continuous
		Update water balance at least twice a year	N/A	Bi-annual
All	Impact on surface water quality	Design and manage all storm water infrastructure to comply with the regulations to prevent discharges from waste water infrastructure during rainfall events	N/A	Continuous
		Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops)	N/A	Continuous
		There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years.	N/A	Continuous
		Re-use water and limit the volume of water stored in waste water dams. The operating protocol is as follows: Process water (including dust suppression) must be obtained from: The Storm water / Return water dam unless it is empty; Water from the opencast (Void 2) unless it is empty; Water for domestic purposes will be obtained from the	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		registered boreholes. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs.		
		Avoid contamination of soils and implement appropriate remedial measures if incidents of spillage occur as well as responsible waste management practices. Implement all management measures pertaining to waste and water management as set outlined in the IWWMP.	N/A	Continuous
		The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall.	N/A	Bi-annual
		Operate the storm water / Return water dam to have 0.8 m freeboard	N/A	Continuous
		Implement storm water management before land clearing start at opencast sections	N/A	Before construction start
		Conduct inspection of water infrastructure to detect leaks and replace / repair immediately	N/A	Continuous
		Vehicle will be maintenance	N/A	Continuous
		Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them	N/A	Continuous
		Monitor quantities and qualities of all water that is discharged	N/A	As needed
		Construct river diversion infrastructure during the dry season	N/A	As needed
		Contaminated water will be contained within an isolated dirty water system	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Generation of contaminated water to be reduced as far as possible. All pit water to be pumped to Void 2 on a continuous basis to minimise exposure to waste material	N/A	Continuous
		The storm water diversion trenches will be kept free from obstructions to ensure that their efficiency is not rendered negatively. Storm water control measures will be incorporated with open pit mining progression to enhance the efficiency of the system	N/A	Continuous
		No construction or maintenance of roads, berms or any water management facility will be undertaken with carbonaceous material	N/A	Continuous
		The water pollution control management facilities will be operated in such a way as to ensure that the available capacity and freeboard requirements as depicted in GN 704 are adhere to at all times	N/A	Continuous
		Minimisation and where possible prevention of water pollution stemming from mining activities by compliance with and adherence to management commitments	N/A	Continuous
		Appropriate storm water management over the entire footprint of the project area to ensure reduction in pollution of surface water quality	N/A	Continuous
		Assessment of the cumulative impacts from nearby mines with the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted	N/A	As per the surface water monitoring programme
		Waste water facilities liner systems will be approved by the DWS in line with current applicable legislation	N/A	Continuous
		Monitoring of water resources will be carried out in accordance with an approved monitoring programme	N/A	As per the surface water monitoring programme
		Update salt balance at least twice a year	N/A	Bi-annual
Opencast and Underground mining	Alteration of the natural river / water courses	Reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed.	N/A	During rehabilitation
		A 100 m buffer zone be placed alongside the riparian banks of all watercourses and that no additional	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		mining or mining activities should occur within this area.		
		The necessary mitigation be put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas.	N/A	Continuous
		Riparian habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic.	N/A	Annually
		SASS5 aquatic invertebrate assessment must be conducted (in conjunction with diatom sampling if available in South Africa) as part of the aquatic monitoring plan for the mine in the Dwars River.	N/A	Bi-annual
		Responsible development in a sensitive environment (drainage line)	N/A	Continuous
		Diversion of drainage lines at Klarinet opencast area and release of diverted water in a responsible manner	N/A	Continuous
		Storm water runoff from roads will be attenuated using energy dissipation to reduce risk of erosion of water courses	N/A	Continuous
		Catch pits and silt traps will be constructed at strategic locations to reduce siltation of the water courses	N/A	Continuous
		Regular maintenance of roads and associated surface water management structures will be undertaken	N/A	Continuous
		Monitoring of water resources will be carried out in accordance with an approved monitoring programme	N/A	As per the surface water monitoring programme
		Mine infrastructure layout to be based on site selection to prevent the construction of pollution control facilities on sensitive areas such as drainage lines	N/A	Continuous
		Surface subsidence of rehabilitated areas and differential settlement will be repaired by backfilling and sloping to prevent ponding and promote free draining	N/A	During rehabilitation

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Construct river diversion infrastructure as needed at the opencast area once approval from Department of Water Affairs is received	N/A	As needed
All	Lowering of groundwater levels due to mining related activities	Carry out rehabilitation of mined land concurrent with mining.	N/A	Continuous
		Monitor groundwater in boreholes associated with the opencast pits, tailings areas, pollution control dams, WWTW's and those boreholes identified for monitoring in surrounding areas. Where boreholes do not exist, these will need to be drilled in the relevant positions.	N/A	As specified in ground water monitoring plan
		Monitoring of boreholes should be carried out monthly for the first 12 months of operation. Thereafter reduce the groundwater monitoring program to a quarterly frequency, subject to acceptance of the revised monitoring program by DWS.	N/A	Monthly, then quarterly
		Should the mining operation be shown to be impacting on adjacent groundwater users through a reduction in groundwater yield, level, or deterioration in quality, and such impact be consistent with ground water level results from ECM's groundwater monitoring program, then affected parties should be provided with an alternative source of water of equal quantity and quality, or should be compensated for such loss by ECM, and as agreed with land owners	N/A	As needed
		Rehabilitate mined areas concurrent with mining advance in order to maximise the recovery of clean water runoff.	N/A	Continuous
		Implement surface water control measures to maximise the return of clean runoff to the Steelpoort and Dwars River system.	N/A	Continuous
		Monitor possibly affected boreholes for water levels and water quality	N/A	As per the groundwater monitoring plan
All	Negative impact on groundwater quality as a result of mining activities and tailings dams	Numerical modelling needs to be undertaken to shown what decant will occur once water levels have recovered to pre-mining levels. The actual volume of decant will need to be confirmed by monitoring. The volumes are predicted to be small, and the potential for poor water quality is limited.	N/A	Every 5 years as part of Groundwater situation assessment by Specialist

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Passive water treatment wetlands will be constructed to treat decant water if any.	N/A	As needed
		Implement active intervention measures in the rehabilitated mining areas to capture the decant through active level control. Each area is to be equipped with a pump controlled by a level switch that will activate the pump when water levels rise to the trigger level.	N/A	As needed
		Refine pump locations for each pit, in consultation with a hydrogeologist, as the floor and lower high wall characteristics are better revealed during mining of each pit. To limit off take of poor quality water that may accumulate in the pit, the pump off take should be positioned off the floor of the pit.	N/A	As needed
		Ensure that mine water pumping infrastructure is repositioned to meet the long term pit water regulation need of each pit, if required when each pit is mined out, and that such pumping infrastructure is keyed into the piping infrastructure to dispose of this water.	N/A	As needed
		Implement water and material management strategies, which would mitigate likely Acid Rock Drainage (ARD) and associated water quality impacts during the operational and closure phase of the mining operations as indicated below.	N/A	Continuous
		Effective water management during the operational life of the mine will prevent unnecessary loss of available alkalinity from waste materials. This means prevention of ponding in mining sections and preventing tunnelled sections from flooding whilst operational. Once mined out, flooding of sections should be encouraged as rapidly as possible and the flooded areas should not be allowed to drain again, in order to minimise wetting and drying cycles which exacerbate geochemical weathering.	N/A	Continuous
		Decant water should be pumped from the highest point if water levels need to be controlled. This will reduce the probability of drawing in oxygenated water towards the base of a water body.	N/A	Continuous
		Preventing percolation of groundwater through spoil materials. This may be practically achieved by mining	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		from low-lying areas to high lying areas. This strategy prevents salts (alkalinity) from being leached out of the material and allows low lying areas to be flooded once they have been mined, thus reducing or preventing oxygen ingress to reactive sulphides. An added advantage of this strategy is that water storage capacity is created in the mined area. It is thus likely that pumping and treatment requirements will be reduced and that long term water qualities will be better. The overall benefit should translate into a reduced pollution load emanating from the workings and a lower probability of acidification.		
		Sample boreholes on a monthly basis for a selected set of elements and constituents and record groundwater levels to establish seasonal trends and changes due to mining, if present.	N/A	Monthly (for new boreholes for a period of 12months), then quarterly or as per Groundwater monitoring plan
		Set up and maintain a rain gauge on the mine site. Monitor rainfall on a daily basis and capture rainfall data electronically for the full life of the mine and until closure is obtained.	N/A	Daily
		Bi-annually, have groundwater samples analysed for the full set of elements.	N/A	Bi-annual
		Submit results to the DMR and the Department of Water Affairs on an annual basis.	N/A	Annually
		Initiate siting and drilling of two boreholes in rehabilitated pit areas, in consultation with a hydrogeologist. Boreholes to be drilled after completion of rehabilitation. Boreholes to be fully cased to protect against hole collapse in infilled spoils.	N/A	As needed
		Monitoring of the boreholes must continue until water levels and water quality stabilise, or until an alternative commitment is made and agreed with DMR and DWS in the mine closure plan that will be prepared prior to application for closure of the mine.	N/A	As needed
Operation of Tailings facilities	Elevated water levels due to recharge from tailings dams	N/A	N/A	N/A

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
All	Impact on air quality as a result of operation dust and gaseous emissions	Implement and maintain a dust suppression system on the opencast haul road and service roads associated with the pits. This includes but is not limited to speed limit implementation.	N/A	Continuous
		Suppress road dust when dust entrainment behind vehicles is noticeable.	N/A	Continuous
		Install dust fall-out buckets at relevant positions.	N/A	Continuous
		Carry out monitoring of respirable dust.	N/A	As per the dust monitoring plan
		Sample dust buckets associated with the pits on a monthly basis and implement corrective action as required.	N/A	Monthly
		Service vehicles regularly.	N/A	Continuous
		Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed. Note as per 2021 amendment, the tailings retreatment contractor is busy with trials that may use mulching for tailings retreatment.	N/A	Continuous
Opencast mining	Mining operations within open pit area will impact on Dust fallout (nuisance dust)	This is achieved by emissions quantification of all activities and dispersion modelling; and monitoring of TSP for nuisance dust and health impact purposes respectively	N/A	As per the dust monitoring plan
Processing plans, Stockpiles, opencast and Underground mining	Material handling operations will impact on Dust fallout (nuisance dust)	Implement and maintain a dust suppression system on the opencast haul road and service roads associated with the pits and unpaved roads, this could include speed limit implementation.	N/A	Continuous
Processing plants	Crushing will impact on Dust fallout (nuisance dust)	Suppress road dust when dust entrainment behind vehicles is noticeable.	N/A	Continuous
All	Vehicle entrainment on unpaved roads will impact on Dust fallout (nuisance dust)	Install dust fall-out buckets at relevant positions.	N/A	Continuous
All	Vehicle entrainment on paved roads will impact on Dust fallout (nuisance dust)	Sample dust buckets associated with the pits on a monthly basis and implement corrective action as required.	N/A	Monthly
All	Continuous rehabilitation activities will impact on Dust fallout (nuisance dust)	Service vehicles regularly.	N/A	Continuous
Tailings dams	Wind erosion from tailings dam will impact on Dust fallout (nuisance dust)	Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed. Note as per 2021 amendment, the tailings retreatment contractor is	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		busy with trials that may use mulching for tailings retreatment.		
Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Dust fallout (nuisance dust)	Vegetate soil stockpiles	N/A	Continuous
Overburden and waste rock dump	Wind erosion from overburden / waste rock storage pile will impact on Dust fallout (nuisance dust)	As above	N/A	As above
ROM Stockpiles	Wind erosion from ROM storage piles will impact on Dust fallout (nuisance dust)	As above	N/A	As above
Opencast mining	Drilling and blasting activities – opencast will impact on Dust fallout (nuisance dust)	As above	N/A	As above
Opencast mining	Mining operations within open pit area will impact on Respirable dust (PM10)	As above	N/A	As above
Processing plants and Opencast mining, stockpile areas	Material handling operations will impact on Respirable dust (PM10)	As above	N/A	As above
Processing plant	Crushing will impact on Respirable dust (PM10)	As above	N/A	As above
All	Vehicle entrainment on unpaved roads will impact on Respirable dust (PM10)	As above	N/A	As above
All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	As above	N/A	As above
All	Continuous rehabilitation activities will impact on Respirable dust (PM10)	As above	N/A	As above
Tailings dams	Wind erosion from tailings dam will impact on Respirable dust (PM10)	As above	N/A	As above
Topsoil stockpiles	Wind erosion from topsoil stockpile will impact on Respirable dust (PM10)	As above	N/A	As above
Overburden and waste rock dump	Wind erosion from overburden / waste rock storage pile will impact on Respirable dust (PM10)	As above	N/A	As above
ROM Stockpiles	Wind erosion from ROM storage piles will impact on Respirable dust (PM10)	As above	N/A	As above
Opencast mining	Drilling and blasting activities – opencast will impact on Respirable dust (PM10)	As above	N/A	As above
Opencast mining	Blasting of overburden and reef will impact on Gaseous emissions	As above	N/A	As above

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
All	Release of exhaust emissions from vehicles on paved and unpaved roads will impact on Gaseous emissions	As above	N/A	As above
Underground mining	Release of underground emissions due to diesel operating machinery will impact on Gaseous emissions	As above	N/A	As above
All	Increased noise levels as a result of the mining activities above acceptable levels	Construct earth berms before commencement of mining in order to screen the operational noise sources from the receiving public	N/A	As needed before mining start
		Carry out noise monitoring during the operational phase of the mine to ensure that noise mitigation is effective. Appoint independent noise specialist to carry out day time / night time noise monitoring every second year. First assessment to be carried out during first year of operation. Noise specialist to provide ECM with specialist advice on modification of acoustic berms if such berms prove to be ineffective	N/A	Every second year
		Ensure that the area has been made safe in terms of the Mine Health and Safety Act (500 m) that all people and livestock are outside of the blast exclusion zone (500 metres) prior to blasting.	SANS Blasting	Continuous
		Use electronic detonators whenever possible.	SANS Blasting	Continuous
		Develop and implement a blasting programme that defines a window of time when in the day blasting will occur. This has provisionally been planned for 13h00 – 14h00. ECM to obtain signoff from DMR for this blast management plan, specifically the implementation of special measures that may be required when blasting within 500 meters of the villages. It is recommended that the blasting plan include that blasting is to be avoided during overcast conditions.	SANS Blasting	Continuous
		Communicate blasting programme to the public and directly affected landowners (neighbouring farmers, residents of the local village) so that they can anticipate and/identify blasts as being part of the mining operation.	SANS Blasting	Continuous
		Wherever possible, all blasts at the Tweefontein section should involve sequential detonation of charges, rather than simultaneous detonation of all	SANS Blasting	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		charges in order to reduce both noise and ground shock. The impact of blasting noise on people will not be a problem as there are no people near opencast areas		
Opencast	Risk to humans and equipment as a result of fly rock	Ensure the 500-metre blast exclusion zone is cleared prior to blasting, alternately as directed by the Department of Mineral Resources in the Mine Health and Safety Act/Occupational Health and safety Act	SANS Blasting	Continuous
		Announce all imminent blasts by means of a blast claxton/siren.	SANS Blasting	Continuous
All	Sensitive landscapes present in the vicinity of Tweefontein are the Steelpoort River and Dwars River floodplains and riparian zones.	N/A	N/A	N/A
All	Visibility of the mining activities may impact on the sense of place, visual equity	Provide screening along the public road in the form of overburden dumps developed alongside roads in order to reduce visual intrusion. No screening will be applied near the Klarinet site due to its topographical nature.	N/A	Continuous
		On completion of mining and successful rehabilitation of the mining area this feature could be removed and the footprint grassed, or it may be left intact, depending on agreement between ECM and the landowner	N/A	During rehabilitation
		Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed	N/A	Continuous
		Vegetate screening walls	N/A	Continuous
Opencast	Damage to the village from the recent past	If archaeological sites identified are going to be impacted on by the mining operations, these sites have to be subjected to a Phase II investigation. A Phase II investigation of these sites would require that the archaeologist obtain a permit from the South African Heritage Resources Agency (SAHRA), which would also allow for the demolishing of the site after it has been subjected to the Phase II investigation. Small excavations may have to be conducted in the site in order to collect material from the site	N/A	Continuous
Opencast	Graveyard may be damaged by mining operation	Inform all workers of the historical sites.	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
Opencast	Destruction of mining heritage remains	Exhume and relocate graveyards that will be impacted by mining activities when needed.	N/A	When needed
All	Influx of job seekers into the area	Even though there is no guarantee of securing employment for the local people from the proposed mining activities, a detailed skills survey for the project area should be undertaken.	N/A	When needed
		There is a need for a clear employment policy that is merit based, gender and race neutral and which offers opportunities for employee advancement.	N/A	Continuous
		Award bursaries to young people in local communities on condition that the bursary holders are available for vacation employment and apprenticeships.	N/A	Continuous
		Select young local people who possess good educational qualifications for apprenticeship positions.	N/A	Continuous
		Emphasise the indirect employment opportunities that will come from local contracting by the mine and from the increased local expenditure by mine employees.	N/A	Continuous
		Establish effective and timeous communication with community leaders.	N/A	Continuous
		Ensure that a transparent procurement process for the mine is adhered to at all times is critical. This should include a database of suppliers available in the areas surrounding the mine, as well as their training and support requirements.	N/A	Continuous
		Implementing an extensive and pro-active HIV/Aids policy and campaign.	N/A	Continuous
		ECM should make it clear (through advertisement) that no new recruitment will take place and the area should be patrolled to prevent possible squatting	N/A	Continuous
All	Impact on community safety as a result of mining activities	Fencing around the opencast and underground mines area to be inspected weekly and maintained in competent condition.	N/A	Weekly
		Ensure that signs are erected on all boundary fences warning against entering mining area.	N/A	Continuous
All	Increase in Social pathologies due to influx of job seekers	Security: Appropriate steps (e.g. upgrading of current security system) to be taken in consultation with other mines and relevant stakeholders.	N/A	Continuous
		Health: ECM's HIV/AIDS programme should include not only its employees, but also strive to provide	N/A	Continuous

Activity	**Potential Impact**	**Mitigation measures**	**Compliance with Standards / Standard to be Achieved**	**Time period for implementation**
		community support. HIV/AIDS awareness programmes should be promoted, particularly among adolescents.		
		Pressure on existing infrastructure: ECM is to cooperate with GTLM in terms of its IDP to upgrade infrastructure in the area.	N/A	Continuous
All	Accommodation and social services limitations	The number of local job opportunities is to be maximised. ECM (Samancor) to continue with current housing initiatives, including promotion of home ownership among employees, facilitation of applications for RDP housing subsidies on behalf of employees, provision of housing loans for employees, abolishment of the hostel system, etc. ECM (Samancor) to continue with infrastructural support to selected schools to meet the needs of employees' children. ECM (Samancor) to continue providing health related services and medical schemes for mineworkers and their families.	N/A	Continuous
All	Road maintenance and safety	The most direct road haul routes should be selected where possible. ECM to support GTLM in terms of its IDP to upgrade and maintain local roads. ECM to give preference to maintenance of the R37 road, which is the main tar road passing all the affected communities. Upgrading may be undertaken as joint venture with other mines in the area. Contractors to comply with road signs and safety policy.	N/A	Continuous
All	Safety of Children	ECM is to ensure that existing security fencing and barriers are sufficient to prevent unauthorized access to the premises.	N/A	Continuous
		Educational and information programmes to be implemented at neighbouring schools to advise children on the risk of entering the mine site	N/A	Continuous
All	Aesthetics and impacts on sense of place	Can be further reduced through management of noisy equipment and light lighting and muted colour schemes.	N/A	Continuous
All	Potential Health impacts	Sewage: As there are seven sewage plants in the area, no additional sanitation is required. Sewage will not be pumped into the nearby water courses	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Water quality, noise and dust: The impacts on human health and mitigation measures are addressed in the relevant specialist studies.	N/A	Continuous
All	Influx of job seekers into the area	Preferential targeting of local employment, e.g. use local employment broker/special tendering arrangements	N/A	Continuous
All	Employment and income generation	Local employment to be maximised through training and capacity. Factors currently limiting employability of communities in the Steelpoort area should be addressed in the Social and Labour Plan. A defined percentage of staff should be recruited from the local area. Employment at the mine should be based on the principles of Employment Equity (incl. Mining Charter requirements in terms of women in mining).	N/A	Continuous
All	The use of current employees as construction workers	Re-skilling where necessary to insure continued employment of current staff	N/A	
All	Increase in indirect employment opportunities and local expenditure	Increase efficiency for implementation.	N/A	Continuous
All	local and regional economic benefits and multipliers	Increase efficiency for implementation.	N/A	Continuous
All	Growth in the local housing sector	Assist municipality to upgrade physical and social infrastructure.	N/A	Continuous
All	Development of BEE and SMME opportunities	Refine procedures for implementation	N/A	Continuous
All	Corporate and social investment	Direct through Social Investment fund and integrate activities with other industries in the area.	N/A	Continuous
All	General	Specific issues raised concerning the mine are contained in an independent Issues and Response Report in which comment is provided on each issue raised and, where relevant, a reference is given to indicate where in the approved EIA and EMPr document the issue of concern has been addressed.	N/A	Continuous
		Provide an on-going means of communication with directly affected parties and ECM.	N/A	Continuous
		A complaints and compliments register should be established and be kept at the mine site office in which any complaint or compliment received is documented, the party responsible for follow-up is indicated and the follow-up actions recorded.	N/A	Continuous

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		This register should be kept in an accessible area, probably at the mine administration office front desk.	N/A	Continuous
		The mine manager and ECO must be apprised of any issues raised, within 24 hours of entry into the register. The ECO, in consultation with the mine manager will identify who is responsible to follow up on the issues raised. Contact to be made with the stakeholder within 48 hours of receipt of the issue, and feedback to be provided to the stakeholder that raised the issue, on close out of the issue. The timeframe that will be necessary to address the issue must be communicated during initial contact with the stakeholder.	N/A	Continuous
All	Rehabilitation	On completion of mining , all supporting mine infrastructure will be removed	N/A	During rehabilitation
		Haul roads will have consolidated basement materials lifted and disposed of to pit. Footprint of haul roads will be ripped to a depth of 1.0 meters. Topsoil will be spread over the ripped haul road footprint to a depth of 300 mm and reseeded.	N/A	During rehabilitation
		Pit ramps will be infilled with spoils, profiled to be free draining, top soiled and re-vegetated.	N/A	During rehabilitation
		The on-site vent shaft and explosive silos will be removed from site for re-use. Concrete associated with these will be buried on site in the old workings/spoils of the opencast final void and covered with a minimum of one metre of material (inclusive of topsoil layer).	N/A	During rehabilitation
		Piping and water treatment infrastructure will be maintained on site until water quality monitoring data proves that the water quality is acceptable for direct release to the receiving environment. The detailed closure plan that will be developed will address long term water monitoring and maintenance requirements.	N/A	During rehabilitation
		The tailings dam is being reclaimed and processed and the residue will be pumped to voids. The voids will be rehabilitated with stockpiled soils and vegetated. If decanting occurs, wetlands will be constructed to be passive water treatment facilities.	N/A	During rehabilitation

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		The original dam will be rebuilt in time and has to be rehabilitated.		
		The Tweefontein resource will be mined by opencast and surface mining methods. The overburden material returned to a pit on completion of mining will seal surface mining areas. The high wall line of all rehabilitated pits will be monitored to detect areas of differential settlement of ground following rehabilitation. Should localised cracking or rat holing be identified anywhere along the pit high wall, such areas would be filled in with soil and regressed.	N/A	During rehabilitation
		Inspect the high wall contact line (line of high wall contact with un-mined ground) of all rehabilitated pits annually to identify cracking, sagging or rat holing that may occur due to settlement of materials. Special attention to be paid to the high wall contact above areas where punch or auger mining took place as material may slump into the unfilled underground air space.	N/A	During rehabilitation
		Should cracking, sagging or rat holing along high wall contact be detected, ECO to initiate corrective action which should entail import of fill material and infilling of affected areas. If repaired areas exceed $1m^2$, the area should be reseeded by hand.	N/A	During rehabilitation
		Rehabilitation of the opencast areas on site will follow the mining cut and be completed within the operational phase of the project.	N/A	During rehabilitation
		No final voids will be left in the post-mining topography. All overburden material removed in mining from any individual pit will be returned to a pit and will be shaped to ensure all pit areas are free draining and are returned to pre-mining land capability.	N/A	During rehabilitation
All	Rehabilitation	Rehabilitation will have a positive effect	N/A	During closure
		Rehabilitated areas of grazing capability will comprise a grass community dominated by grasses of pasture origin. These areas will be managed by grazing. ECM to monitor re-grassed areas as indicated in order to demonstrate the trend towards the areas becoming self-maintaining in these rehabilitated systems.	N/A	During rehabilitation

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		On arable areas, a gradual return to wilderness lands will be followed, whereby rehabilitated land will be integrated into the surrounding system as soon as practically possible.	N/A	During rehabilitation
		It is not anticipated that surface subsidence will occur associated with the opencast mined blocks. Some minor settlement may occur, however the pit is located on very gentle slopes and local settlement is unlikely to result in ponding of water. Special attention will be given to the area along the pit high wall where localised settlement may cause short-term cracking or rat holing. Should localised small depressions cracks or rat holes form however they will be corrected to be free draining (import of soil material, re-grading etc.).	N/A	During rehabilitation
		The rehabilitated ground will be monitored for cover and species composition and maintenance will include fertilising, cutting of the grass and replanting open patches of size greater than 2m x 2m.	N/A	During rehabilitation
		Samancor Chrome will remain the responsible party accountable for the end quality of rehabilitated areas within the mine site.	N/A	During rehabilitation
All	No additional impacts expected	Rehabilitation will have a positive effect, ECM could investigate the use of 1) brush packing that will provide cover for e.g. rodents, hares, invertebrates and 2) perches for birds. These will attract animals to the area and could assist with the distribution of seeds to the area by means of the animals' droppings.	N/A	During closure
Opencast	Effect of final void on catchment yield	The final voids will be sized so as not to decant and affect surface water flows	N/A	During rehabilitation
All	Effect on surface water quality	The structures which could require maintenance are:	N/A	During rehabilitation
		Inspect the storm water diversion channels/berms associated with the routing of storm water around the remaining infrastructure. Inspections to be two monthly during the dry season (May to September).	N/A	Monthly
		Inspect dirty water management infrastructure monthly. Inspection to include pipeline from pit to silt trap and return water dams.	N/A	Monthly
		Maintenance of water pollution control structures	N/A	As needed

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
		Ensure that maintenance work is carried out as required.	N/A	As needed
		The recommendation in the previous approved EMPr (Menco 2012) that there will be no residue deposits on the ECM property and that the site will be fully rehabilitated on completion of mining is not feasible. TSFs will remain on site and will be rehabilitated as per an approved plan.	N/A	N/A
		Rehabilitation will have a positive effect	N/A	N/A
Opencast and Underground mining	Possibility for Decant from mining operations	The final voids will be sized so as not to decant and affect surface water flows	N/A	During rehabilitation
		Update groundwater assessment report before final closure	N/A	During rehabilitation
		Seal underground mining areas as soon as possible	N/A	During rehabilitation
Tailings dams	Elevated water levels due to recharge from the tailings dam	N/A	N/A	N/A
Tailings dams	Nitrate pollution from migration from tailings dam	N/A	N/A	N/A
Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on dust fallout (nuisance dust)	N/A	N/A	During rehabilitation
Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on dust fallout (nuisance dust)	N/A	N/A	During rehabilitation
All	Infrastructure removal will impact on dust fallout (nuisance dust)	N/A	N/A	During rehabilitation
All	Vehicle entrainment on unpaved roads will impact on dust fallout (nuisance dust)	N/A	N/A	During rehabilitation
All	Vehicle entrainment on paved roads will impact on dust fallout (nuisance dust)	N/A	N/A	During rehabilitation
Topsoil usage	Topsoil utilised for rehabilitation and revegetation will impact on Respirable dust (PM10)	N/A	N/A	During rehabilitation
Underground mining closure	Demolition, stripping and sealing of mine shafts will impact on Respirable dust (PM10)	N/A	N/A	During rehabilitation

Activity	Potential Impact	Mitigation measures	Compliance with Standards / Standard to be Achieved	Time period for implementation
All	Infrastructure removal will impact on Respirable dust (PM10)	N/A	N/A	During rehabilitation
All	Vehicle entrainment on paved roads will impact on Respirable dust (PM10)	N/A	N/A	During rehabilitation
All	Demolition of infrastructure – blasting will impact on Gaseous emissions	N/A	N/A	During rehabilitation
All	Tailpipe emissions from vehicles will impact on Gaseous emissions	N/A	N/A	During rehabilitation
All	Increase in noise levels as a result of demolition of infrastructure	Ensure that employees wear protective gear when working	N/A	Continuous
All	No additional impacts expected	N/A	N/A	N/A
All	No additional impacts expected	N/A	N/A	N/A
All	No additional impacts expected	N/A	N/A	N/A
All	Cessation of employment	Retrenchment packages should be paid to workers that are retrenched.	N/A	Before final closure
		Staff should be reallocated to other mines.	N/A	Before final closure
		Measures defined in the Social and Labour Plan in terms of reskilling prior to closure should be implemented.	N/A	Before final closure
All	Reduced economic activity	Re-focus and diversification should be facilitated in accordance with sustainable development principles	N/A	Before final closure
All	Potential re-employment of employees	Where possible employees must be assisted in finding employment at other sites.	N/A	Before final closure
All	Changed land-use after rehabilitation	Rehabilitation should take account of sustainable development opportunities and should be formulated with the local community	N/A	Before final closure

6.1. Geology Management measure for implementation

Please also refer to Appendix 6.

- No mitigation is possible to protect the mineral resource as there is no way that the mineral resource could be replaced once it has been extracted
- Voids left as a result of chrome removal at opencast areas must be backfilled
- Disturbances caused by geological exploration must be rehabilitated
- Trenches and boreholes must be levelled and covered with topsoil
- Area disturbed by exploration must be seeded and vegetated
- Should erosion occur suitable alternatives such as mulching and shelter beds for wind erosions should be investigated

6.2. Topography Management measure for implementation

Please also refer to Appendix 6.

- The hard and soft material place in mined out areas must be re-profiled in keeping with the adjacent un-mined areas
- At the contact between the pit and the un-mined land the slope of the ground must not exceed 5%
- Shape the topography so that it is free draining and reshape areas of arable land capability so that it does not have a slope greater than 4%
- Replace topsoil to achieve required pre-mining land capability
- Re-vegetate rehabilitated areas
- On completion of mining:
    - All supporting mine infrastructure will be removed
    - Haul roads will have consolidated basement materials lifted and disposed of to pit. Footprint of haul roads will be ripped to a depth of 1.0 meters. Topsoil will be spread over the ripped haul road footprint to a depth of 300 mm and reseeded
    - Pit ramps will be infilled with spoils, reprofiled to be free draining, top soiled and re-vegetated
    - The on-site vent shaft and explosive silos will be removed from site for re-use. Concrete associated with these will be buried on site in the old workings/spoils of the opencast final void and covered with a minimum of one metre of material (inclusive of topsoil layer)
    - Piping and water treatment infrastructure will be maintained on site until water quality monitoring data proves that the water quality is acceptable for direct release to the receiving environment. The detailed closure plan that will be developed will address long term water monitoring and maintenance requirements
    - The tailings dam is being reclaimed and processed and the residue will be pumped to voids. The voids will be rehabilitated with stockpiled soils and vegetated. If decanting occurs, wetlands will be constructed to be passive water treatment facilities. The original dam will be rebuilt in time and has to be rehabilitated
    - The Tweefontein resource will be mined by opencast and surface mining methods. The overburden material returned to a pit on completion of mining will seal surface mining areas. The high wall line of all rehabilitated pits will be monitored to detect areas of differential settlement of ground following rehabilitation. Should localised cracking or rat holing be identified anywhere along the pit high wall, such areas would be filled in with soil and regressed
    - Inspect the high wall contact line (line of high wall contact with un-mined ground) of all rehabilitated pits annually to identify cracking, sagging or rat holing that may occur due to settlement of materials. Special attention to be paid to the high wall contact above areas where punch or auger mining took place as material may slump into the unfilled underground air space

- Should cracking, sagging or rat holing along high wall contact be detected, the ECO will initiate corrective action which should entail import of fill material and infilling of affected areas. If repaired areas exceed 1 m^2, the area should be reseeded by hand
- Rehabilitation of the opencast areas on site will follow the mining cut and be completed within the operational phase of the project
- No final voids will be left in the post-mining topography. All overburden material removed in mining from any individual pit will be returned to a pit and will be shaped to ensure all pit areas are free draining and are returned to pre-mining land capability.

6.3. Soils, Land use and land capability measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

6.3.1. Soils

- All topsoil stockpiles to be protected from erosion by a development of an earth deflection bund upslope of the stockpile
- Clean affected area immediately and place contaminated soil in special bin
- Construct surface water control berms on the contour to manage storm water runoff onto rehabilitated sites until such time as the re-established vegetation community has stabilised
- If soil stockpiles are going to be left for more than 12 months, vegetate soil stockpiles to minimise soil loss to wind and water erosion. Vegetation to comprise seeding with commercially available pasture grasses
- Place drip trays under vehicles
- Prior to planting or seeding, conduct routine fertility analysis and fertilise accordingly to create growing conditions that are suitable for plant growth
- Re-establish drainage lines at a drainage density equal to or greater than the pre-mining drainage density
- Service vehicles regularly
- Strip all usable soil ahead of mining. This should comprise the entire A-horizon and the majority of the B-horizon material, until 10 percent (10 %) mottling is evident in sub-soils. Soil should be stripped during low rainfall conditions
- Where possible, place stripped topsoil directly onto reprofiled and shaped areas to minimise the volume of soil that needs to be stockpiled
- Where soil must be stockpiled, site the topsoil stockpiles up slope or next to, but not down slope of, the mining operation so as to minimise the risk of topsoil contamination
- Within the footprint of the opencast area, extra care will need to be taken to recover all usable topsoil
- Topsoil must be stripped from the cleared sites as for undisturbed areas

6.3.2. Land capability

- ECM to conduct monitoring of rehabilitated areas to assess performance of the rehabilitation approach employed. Rehabilitated areas should be monitored annually to identify: (1) occurrence of surface erosion, (2) vegetation die back, (3) salinization of the soil surface, (4) fertility status of rehabilitated land, (5) the emergence of alien/exotic vegetation
- Implement soil protection and conditioning measures as outlined above
- In the event that non-performance is identified, the ECO will implement a plan for corrective action, and will seek the advice of rehabilitation ecologists as required
- Re-establish surface drainage and a free draining landform
- Reinstate land capability classes with the exception of the area where shallow soils depths occur resulting in classification of the area as having a wilderness land capability. These areas to be returned to wilderness land capability by return of more than 300 mm soil to the reprofiled spoils

6.3.3. Land use

- Burning of fire breaks around veld areas should be carried out in agreement with neighbouring communities or land owners and permits to burn obtained prior to undertaking activity
- Make rehabilitated land areas of wilderness potential available for controlled use as soon as possible in order to facilitate the reintegration of these areas into the regional framework
- The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated
- To ensure that the after mining land use is sustainable the following will be done:
    - Rehabilitated areas of grazing capability will comprise a grass community dominated by grasses of pasture origin. These areas will be managed by grazing. ECM to monitor re-grassed areas as indicated in order to demonstrate the trend towards the areas becoming self-maintaining in these rehabilitated systems
    - On arable areas, a gradual return to wilderness lands will be followed, whereby rehabilitated land will be integrated into the surrounding system as soon as practically possible
    - It is not anticipated that surface subsidence will occur associated with the opencast mined blocks. Some minor settlement may occur, however the pit is located on very gentle slopes and local settlement is unlikely to result in ponding of water. Special attention will be given to the area along the pit high wall where localised settlement may cause short-term cracking or rat holing. Should localised small depressions cracks or rat holes form however they will be corrected to be free draining (import of soil material, re-grading etc.)
    - The rehabilitated ground will be monitored for cover and species composition and maintenance will include fertilising, cutting of the grass and replanting open patches of size greater than 2m x 2m
    - Samancor Chrome will remain the responsible party accountable for the end quality of rehabilitated areas within the mine site

6.4. Terrestrial biodiversity measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1. In addition to the management measures as outlined in the following two sections the following were proposed for implementation by the 2020 assessment (Red Kite Environmental Solutions, 2020):

- Pre-Construction Phase:
    - The Relevant Authorisations needed for all protected species, in terms of NEMBA (ToPS List), the LEMA and the National Forests Act, 1998 (Act No. 84 of 1998), will be required if any species will be impacted by the development.
    - No animal species should be harmed, hunted, relocated or caught during the development without a permit. Therefore, it is recommended that the new areas be fenced and animals should be allowed to freely move away to ensure that they are not harmed and not require specialist relocation. If relocation or intervention is required, a specialist should be consulted to ensure the correct path of action is chosen.
- Construction and operational phase:
    - Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and visitors to comply with these mitigation measures
    - Ensure that the sites are lined as per relevant waste management regulations for the TSF and WRD area
    - Ensure adequate stormwater management as to ensure that potentially polluted water do not enter the natural environment surrounding the footprint area, specifically since the activity will have the definite potential to leach and pollute the environment
    - A management plan for the control of invasive/alien weed species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-

treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance. The cleared areas after removal should be re-vegetated with indigenous naturally occurring species to decrease large patches of bare soil. The best mitigation measure in this regard is avoiding invasive and/or exotic species from being established. This should not only be conducted within the direct location of the operational area but also into surrounding area which may be impacted by the project. It is vital that the control of alien invasive species is ongoing

- Adequate waste storage and disposal must be implemented at the development. Littering must be prevented and regularly cleaned up and form part of good housekeeping practices to be implemented around site
- Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora
- It is also vital that no additional fragmentation occur and that all roads are clearly demarcated and kept to a minimum without any exceptions and within the proposed footprints where possible
- All footprint areas should remain as small as possible
- Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act 71 of 1962) and Limpopo Environmental Management Act, 2003 (LEMA) (Act No. 7 of 2003)
- The vegetation removal (and associated fauna) should be controlled and should be very specific
- Priority species, specifically nests if encountered, should be identified first and a management plan should be established for each of the priority species if these are encountered during any phase of the activity
- It is vital that if any endemic, rare or vulnerable species occurs on the proposed site that these species should be protected and/or left undisturbed. Only as an exception can these species be relocated to favourable sites with the use of a specialist prior to vegetation and habitat removal. If at any point any SCC is encountered, a specialist should be consulted as to determine the best way forward and a permit should be obtained if any intervention is required

- Decommissioning and closure:
  - The activity area should be well demarcated and workers should not enter adjacent areas
  - Depending on final land use, the surfaces needs to be prepared to be able to re-establish vegetation on bare areas
  - Alien Invasive species will need to be managed to prevent newly rehabilitated areas becoming invested with invasive species
  - Ensure that an acceptable aesthetic scenario is created post closure
  - When closure is considered successful and rehabilitation complete, unnecessary fences/barriers should be lifted to restore larger foraging areas
  - Close monitoring of faunal communities to ensure that ecology is restored and self-sustaining
  - Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly damage flora
  - Re-vegetation of all degraded areas and bare patches is advised to speed recovery to natural, self-sustaining state as soon as possible (if this is aligned with the final landform described in the EMP)

6.4.1. Natural vegetation and plant life

- Appoint an ecologist to carry out vegetation monitoring at regular intervals (two years) within each area that has been re-vegetated to establish the progression towards self-sustainability in re-vegetated areas
- Avoid areas where rare plant species occur
- Include other native grass seed in the mixture applied when such seed is available

- Include successive rehabilitated areas of the Tweefontein opencast into an annual land monitoring programme
- Inspect all land areas under ECM control annually, at the start of the summer period
- Keep rehabilitated land clear of alien vegetation through regular inspection and clearing of young plants
- Maintain an active follow up programme in cleared areas to control re-growth and seedling establishment and thereby prevent re-infestation of the cleared areas
- Map areas of exotic vegetation, should such vegetation develop on the areas of the site outside of the mine pit footprint. Classify areas of infestation as areas of heavy, medium or light infestation. Define the perimeters of these areas and manage as follows: (1) Fix the perimeter of each area. (2) Actively eradicate any new exotic vegetation outside of the heavily infested areas. (3) Starting with the areas of light infestation, actively eradicate the exotic vegetation from within the identified areas
- Monitoring should include assessment of the following: (1) species abundance and basal cover (2) an estimation of biomass yield (3) index of plant species diversity within the rehabilitated plant community
- Relocate rare plant species when needed, e.g. aloes, succulents and woody species
- Sow the prepared areas with a seed mixture which will produce a grass cover at various levels and over as much of the growing season as possible. The seed mix should consists of the following: (1) *Eragrostis tef* (teff) 1 - 2 kg/ha (2) *Medicago sative* (Lucerne) 1 - 2 kg/ha (3) *Cynodon dactylon* (couch grass) 2 - 4 kg/ha (4) *Chloris gayana* (Rhodes grass) 4 - 6 kg/ha (5) *Digitaria eriantha* (Smuts finger grass) 4 - 6 kg/ha.

6.4.2. Animals / Fauna

- Do not allow hunting or trapping of game or birds on the site
- Ensure that environmental education of mine staff takes place at all levels to limit unnecessary damage to habitats and/or disturbance of fauna. Develop environmental module to form part of site induction programme. All contractors and staff to attend induction
- Manage the development of the mining window in such a manner that the footprint of disturbance is minimised

6.5. Surface water management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

- As far as possible a 100 m buffer zone is placed alongside the riparian banks of all watercourses and that no additional mining or mining activities should occur within this area
- Construct river diversion infrastructure as needed in a responsible manner once approval from DWS is received and during the dry season
- Appropriate storm water management must be implemented over the entire footprint of the project area to ensure reduction in pollution of surface water quality
- Assessment of the cumulative impacts from nearby mines with the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted
- Avoid contamination of soils and implement appropriate remedial measures if incidents of spillage occur as well as responsible waste management practices
- Implement all management measures pertaining to waste and water management as set outlined in the IWWMP
- Catch pits and silt traps will be constructed at strategic locations to reduce siltation of the water courses
- Conduct inspection of water infrastructure to detect leaks and replace / repair immediately
- Contain all contaminated water in a dedicated design facility to adhere to legislation and to contain a 1:50 year storm event and have a 0.8m freeboard

- Contaminated water will be contained within an isolated dirty water system
- Design and manage all storm water infrastructure to comply with the regulations to prevent discharges from waste water infrastructure during rainfall events
- Design culverts and bridges so that the flood times and water retention times do not impact on mining infrastructure
- Develop a mining layout with sufficient walls, board and pillars to prevent subsidence
- Effective and efficient use of the existing available water resources in all water use sectors within the mine (WCDM)
- Ensure that all hazardous substances (Oils etc.) are stored in an appropriate facility (Bund walls / roofs)
- Generation of contaminated water to be reduced as far as possible. All pit water to be pumped to Void 2 on a continuous basis to minimise exposure to waste material
- If the water collected is contaminated implement treatment measures before release
- Implement a rehabilitation strategy for the stream diversions at Klarinet
- Implement storm water management before land clearing start at opencast sections
- Implement storm water management to divert clean water around the mining area to ensure that the dirty footprint is kept to a minimum
- Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops)
- Mine infrastructure layout to be based on site selection to prevent the construction of pollution control facilities on sensitive areas such as drainage lines
- Minimisation and where possible prevention of water pollution stemming from mining activities by compliance with and adherence to management commitments
- Monitor quantities and qualities of all water that is discharged
- Monitoring of water resources will be carried out in accordance with an approved monitoring programme
- No construction or maintenance of roads, berms or any water management facility will be undertaken with carbonaceous material
- Optimise water use by means of waste water minimisation, and increasing the reuse and recycling of waste water
- Quantitative and qualitative assessment of the water resources on the mining property to effectively conduct Integrated Water Resource Management
- Regular maintenance of roads and associated surface water management structures will be undertaken
- Regular maintenance of surface water management infrastructure to be done in order to prevent silt build up
- Reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed
- Responsible development in a sensitive environment (drainage line)
- Return post mining topography to as close as possible to pre-mining situation
- Return the surface water drainage pattern to as close as possible to pre-mining situation
- Re-use water and limit the volume of water stored in waste water dams. The operating protocol is as follows: Process water (including dust suppression) must be obtained from: The Storm water / Return water dam unless it is empty; Water from the opencast (Void 2) unless it is empty; Water for domestic purposes will be obtained from the registered boreholes. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs
- Riparian habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic
- SASS5 aquatic invertebrate assessment must be conducted (in conjunction with diatom sampling if available in South Africa) as part of the aquatic monitoring plan for the mine in the Dwars River

- Seal against the loss of water from the beds of the river
- Should ingress occur, collect seepage in the highest mining level and pump out as soon as possible
- Storm water runoff from roads will be attenuated using energy dissipation to reduce risk of erosion of water courses
- Surface subsidence of rehabilitated areas and differential settlement will be repaired by backfilling and sloping to prevent ponding and promote free draining
- The necessary mitigation is in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas
- The storm water diversion trenches will be kept free from obstructions to ensure that their efficiency is not rendered negatively. Storm water control measures will be incorporated with open pit mining progression to enhance the efficiency of the system
- The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall
- The water pollution control management facilities will be operated in such a way as to ensure that the available capacity and freeboard requirements as depicted in GN 704 are adhere to at all times
- There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years
- Update salt balance at least twice a year
- Update water balance at least twice a year
- Vehicles will be maintenance
- Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them
- To reduce or prevent decant and impact on surface water resources the final voids will be sized so as not to decant and affect surface water flows
- General Maintenance in the closure / after closure phase will include:
  - Inspect the storm water diversion channels/berms associated with the routing of storm water around the remaining infrastructure. Inspections to be two monthly during the dry season (May to September)
  - Inspect dirty water management infrastructure monthly. Inspection to include pipeline from pit to silt trap and return water dams. Maintenance of water pollution control structures
  - Ensure that maintenance work is carried out as required

The previous approved EMPr indicated that:

- There will be no residue deposits on the ECM property after closure and the site will be fully rehabilitated on completion of mining. This is however not feasible as the Waste rock Dump and TSFs will remain on site and will be rehabilitated as per an approved plan.
- Waste water facilities will be clay lined to prevent seepage and groundwater pollution. This has been amended to ensure that liner systems will be approved by the DWS in line with current applicable legislation.

In addition to the existing measures as outlined above the follow should be implemented as per the 2020 assessment (Prescali Environmental Consultants, 2020):

- Soil contaminated with mine residue material should be removed and disposed at the same site as the residue deposit
- Foreign material in the unnamed tributary e.g. pipes must be removed

6.6. Groundwater management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

- Carry out rehabilitation of mined land concurrent with mining
- Decant water should be pumped from the highest point if water levels need to be controlled. This will reduce the probability of drawing in oxygenated water towards the base of a water body
- Effective water management during the operational life of the mine will prevent unnecessary loss of available alkalinity from waste materials. This means prevention of ponding in mining sections and preventing tunnelled sections from flooding whilst operational. Once mined out, flooding of sections should be encouraged as rapidly as possible and the flooded areas should not be allowed to drain again, in order to minimise wetting and drying cycles which exacerbate geochemical weathering
- Ensure that mine water pumping infrastructure is repositioned to meet the long term pit water regulation need of each pit, if required when each pit is mined out, and that such pumping infrastructure is keyed into the piping infrastructure to dispose of this water
- Implement active intervention measures in the rehabilitated mining areas to capture the decant through active level control. Each area is to be equipped with a pump controlled by a level switch that will activate the pump when water levels rise to the trigger level
- Implement surface water control measures to maximise the return of clean runoff to the Steelpoort and Dwars River system
- Implement water and material management strategies, which would mitigate likely Acid Rock Drainage (ARD) and associated water quality impacts during the operational and closure phase of the mining operations as indicated below
- Initiate siting and drilling of two boreholes in rehabilitated pit areas, in consultation with a geohydrologist. Boreholes to be drilled after completion of rehabilitation. Boreholes to be fully cased to protect against hole collapse in infilled spoils
- Monitor groundwater in boreholes associated with the opencast pits, tailings areas, pollution control dams, WWTW's and those boreholes identified for monitoring in surrounding areas. Where boreholes do not exist, these will need to be drilled in the relevant positions
- Monitor possibly affected boreholes for water levels and water quality
- Monitoring of boreholes should be carried out monthly for the first 12 months of operation. Thereafter reduce the groundwater monitoring program to a quarterly frequency, subject to acceptance of the revised monitoring program by DWS
- Monitoring of the boreholes must continue until water levels and water quality stabilise, or until an alternative commitment is made and agreed with DMR and DWS in the mine closure plan that will be prepared prior to application for closure of the mine
- Numerical modelling needs to be undertaken to shown what decant will occur once water levels have recovered to pre-mining levels. The actual volume of decant will need to be confirmed by monitoring. The volumes are predicted to be small, and the potential for poor water quality is limited
- Passive water treatment; wetlands will be constructed to treat decant water if any
- Preventing percolation of groundwater through spoil materials. This may be practically achieved by mining from low-lying areas to high lying areas. This strategy prevents salts (alkalinity) from being leached out of the material and allows low lying areas to be flooded once they have been mined, thus reducing or preventing oxygen ingress to reactive sulphides. An added advantage of this strategy is that water storage capacity is created in the mined area. It is thus likely that pumping and treatment requirements will be reduced and that long term water qualities will be better. The overall benefit should translate into a reduced pollution load emanating from the workings and a lower probability of acidification
- Refine pump locations for each pit, in consultation with a geohydrologist, as the floor and lower high wall characteristics are better revealed during mining of each pit. To limit off take of poor quality water that may accumulate in the pit, the pump off take should be positioned off the floor of the pit

- Rehabilitate mined areas concurrent with mining advance in order to maximise the recovery of clean water runoff
- Sample boreholes on a monthly basis for a selected set of elements and constituents and record groundwater levels to establish seasonal trends and changes due to mining, if present
- Set up and maintain a rain gauge on the mine site. Monitor rainfall on a daily basis and capture rainfall data electronically for the full life of the mine and until closure is obtained
- Should the mining operation be shown to be impacting on adjacent groundwater users through a reduction in groundwater yield, level, or deterioration in quality, and such impact be consistent with ground water level results from ECM's groundwater monitoring program, then affected parties should be provided with an alternative source of water of equal quantity and quality, or should be compensated for such loss by ECM, and as agreed with land owners
- Submit results to the DMR and the Department of Water Affairs on an annual basis
- To reduce the potential of decant after closure final voids will be sized so as not to decant and the geo-hydrological assessment will be updated. In addition all underground mining areas will be sealed as soon as possible

In addition to the above the following management measures were outlined in the 2020 assessment (GPT, 2020) for the operational phase:

- General
  - Identify and where possible, maximise areas of the mine that will result in clean storm water runoff (for example open veld areas) as well as infrastructure associated with the mine (for example office areas) and ensure that runoff from these areas is routed directly to natural watercourses and not contained or contaminated
  - Ensure that clean storm water is only contained if the volume of the runoff poses a risk, if the water cannot be discharged to watercourses by gravitation, for attenuation purposes, or when the clean area is small and located within a large dirty area. This contained clean water should then be released into natural watercourses under controlled conditions
  - Ensure the minimisation of contaminated areas, reuse of dirty water wherever possible and planning to ensure that clean areas are not lost to the catchment unnecessarily
  - Ensure that seepage losses from storage facilities (such as polluted dams) are minimised and overflows are prevented
  - Ensure that all possible sources of dirty water have been identified and that appropriate collection and containment systems have been implemented and that these do not result in further unnecessary water quality deterioration
  - Ensure that less polluted water or that: moderately polluted water is not further polluted
  - Where possible less and more polluted water should be separated. This will assist in the reuse water strategy and improve possibilities for reuse based on different water quality requirements by different mine water uses
  - Where contaminants are transported along construction roads, emergency containment and mitigation measures must be developed to minimize impacts should accidental spillages occur along the transport routes
  - Store all potential sources of contamination in secure facilities with appropriate Storm Water management systems in place to ensure that contaminants are not released to the water resource through Storm Water runoff
  - Separate and collect all storm water that has a quality potentially poorer than the water quality specified and negotiated for the specific catchment into dirty water storage facilities for reuse within the mining operations
  - Ensure that all storm water structures that are designed to keep dirty and clean water separate can accommodate a defined precipitation event. (The magnitude of the precipitation event used in such an objective statement must, as a minimum, adhere to the relevant legal requirements.)
  - Route all clean storm water directly to natural watercourses without increasing the risk of a negative impact on safety and infrastructure, e.g. loss of life or damage to property due to an increase in the peak runoff flow

  - Ensure that the maximum volume of clean water runoff is diverted directly to watercourses and the minimum amount of storm water reports to the pit floor of an open cast mine
  - Develop and implement proper environmental management and auditing systems to ensure that pollution prevention and impact minimisation plans, and measures developed in the design and feasibility stages are fully implemented
  - The size of unrehabilitated areas (pit, spoils, unvegetated areas) that produce contaminated runoff should be minimised
  - Rehabilitation should be planned to promote free drainage and to minimise or eliminate ponding of storm water. On-going rehabilitation as mining operations progress is required
  - The clean and dirty water flow areas on a mine site should be identified
  - Every effort should be made to maximise the clean area and minimise the dirty area when locating the diversion berms, channels and dams. In the case of a new mine, the maximisation of the clean areas should have an influence in overall mine planning and the location of the mine infrastructure
  - The mine planning should consider concurrent rehabilitation of mine workings and waste management facilities, to maximise the areas of clean runoff that can be discharged to the natural watercourses
- Waste rock deposits and pollution control dams
  - Monitoring of water storage facilities, particularly pollution control dams, is imperative to manage the risk of spillage from the dams. Stage-storage (elevation-capacity) curves are useful tools to monitor the remaining capacity within a water storage facility.
  - Prevent the erosion or leaching of materials from any residue deposit or stockpile from any area and contain material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams or any other effective measures to prevent this material or substance from entering and polluting any water resources
  - Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA.
  - Water that has been in contact with residue, and must therefore be considered polluted, must be kept within the confines of the MRD until evaporated, treated to rendered acceptable for release, or re-used in some other way
  - All water that falls within the catchment area of the residue deposit must be retained within that area. For most residue deposits the catchment can be divided into component catchments, as follows:
    - The top area of the MRD together with any return water storage dams which have been connected to the top area of the MRD by means of an outfall penstock, and
    - The faces of the MRD together with the catchment paddocks provided to receive run-off from the faces and any additional catchment dams associated with the faces and catchment paddocks
- The design, operation and closure of residue deposits should incorporate consideration of the risk of changes in the mining and plant operations, and hence the mine water balance, through the life cycle of the mine
- A system of storm water drains must be designed and constructed to ensure that all water that falls outside the area of the MRD is diverted clear of the deposit. Provision must be made for the maximum precipitation to be expected over a period of 24 hours with a probability of once in one hundred years. A freeboard of at least 0.5 m must be provided throughout the system above the predicted maximum water level. This requirement applies to all residue deposits
- Ensure that the water use practices on and around the residue deposits do not result in unnecessary water quality deterioration, e.g. use of the return water dam for storage of poorer quality water
- Should the above be insufficient to capture polluted surface and groundwater moving towards the Dwars River an interception trench can be designed as follows:

    - The depth of the trench should be at least 4 mbgl (or 2 m below the groundwater level) to intercept polluted seepage that resulted from the WRD
    - The design of the trench gradient must be such that the water is free flowing without eroding the channel
    - The water from the trench must be captured, retained and managed within the mine water systems
- Underground mines
    - All openings to the mine need to be sealed or have adequate berms surrounding the openings to prevent surface water entering
    - All boreholes should be sealed from the bottom to the top to prevent groundwater entering the hole and feeding into the mine workings
    - All depressions created by mining need to be profiled for self-drainage of surface water away from the workings
    - Should depressions created by mining not be able to be filled, then the areas need to be surrounded by berms to prevent surface water ingress to the mine workings
    - Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source in order that it can be pumped out of the mine before its quality can deteriorate through contact with sulphide minerals
    - Properly mark all significant water ingress points encountered during mine construction and development and ensure that their physical location, flowrate and water quality are recorded and incorporated into the existing groundwater model and the mine water and salt balance
    - Properly seal all major water ingress points and ensure that the details of the sealing operation are recorded
    - Ensure that all approved design measures are properly implemented and modify mine plans and drawings to indicate 'as-built' systems wherever they deviate from the original designs, together with motivations on the design variation
    - Institute appropriate water level and water quality monitoring programmes to confirm rate of water rise and water quality as the mine floods. Maintain an ability to access the underground workings until long term discharge and quality predictions have been confirmed
    - A particular concern when storing water underground where it is likely to be in contact with sulphide minerals is to manage the storage systems in a manner that absolutely minimizes the potential for water quality deterioration to occur. This would imply that storage reservoirs must be filled as quickly as possible and that measures must be put in place to prevent regular fluctuation of the stored water level as it is this wetting and drying cycle on the exposed surfaces that will enhance the rate of sulphide oxidation and lead to water quality deterioration
    - Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA. See the Monitoring Network section
    - Areas that may have subsided or areas of depressions and/or sinkholes should be filled to create free draining surfaces

GPT (GPT, 2020)proposed the following management measures during the Decommissioning and Post-Closure Phase:

- Waste rock deposits
    - Update the numerical and geochemical model against monitored data
    - Polluted groundwater can be treated as follows:
        - Reduce hydraulic head by water shedding
        - Integrate capture store-release systems
        - Utilise evapotranspiration
        - Cap and cover with capillary break
        - Drainage diversions

    - Neutralisation and detoxification of tails seepage
    - Wetland filtration
- Underground mines
  - Institute water level and water quality monitoring programmes to confirm rate of water rise and water quality as the mine floods. Maintain an ability to access the underground workings until long term discharge and quality predictions have been confirmed
  - Service boreholes need to be plugged from the bottom where they intersect the workings and then grouted through to surface. It would be advantageous if the bords can be backfilled (e.g. with ash) to give further support to the roof to reduce the risk of bord failure which could destroy the plug and grouting thus allowing water to ingress into the workings
  - Shafts should be sealed as below

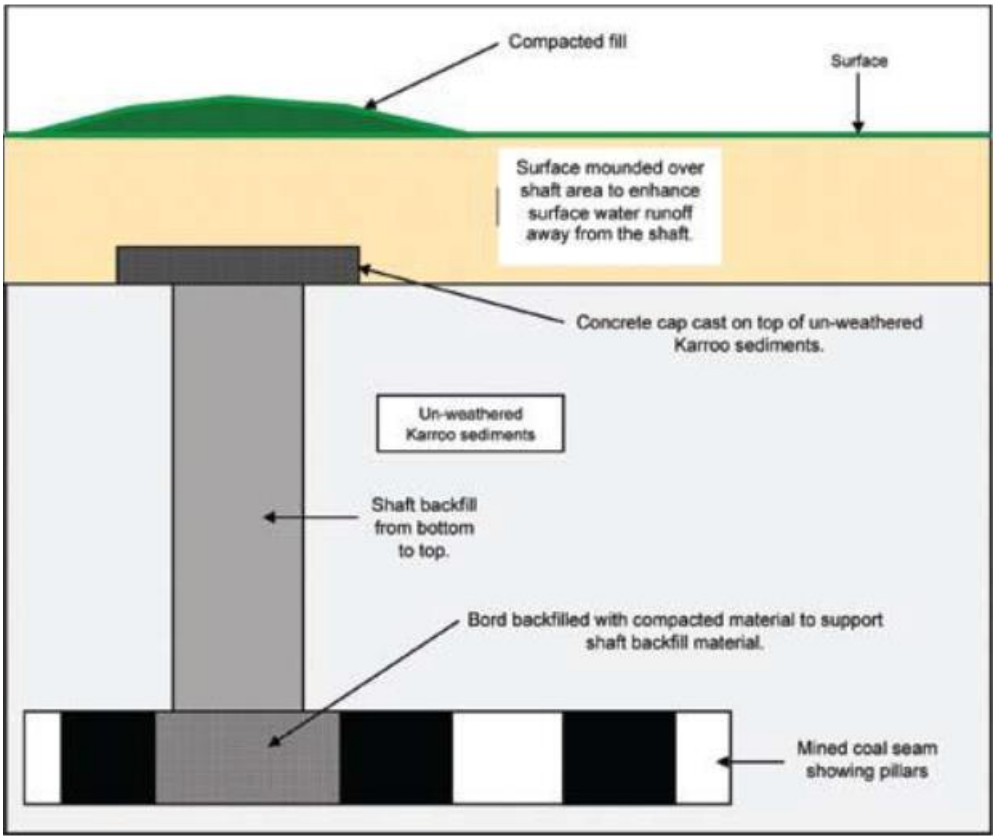


Figure 6-1: Shaft sealing example

- Tailing Storage Facilities
  - Should low volumes of water be encountered (< 5 ℓ/s) an interception trench can be designed as follows:
    - The depth of the trench should be at least 4 mbgl (or 2 m below the groundwater level) to intercept polluted seepage that resulting from the opencast pit
    - The design of the trench gradient must be such that the water is free flowing without eroding the channel
    - The water from the trench must be captured, retained and managed within the mine water systems i.e., lined evaporation dams until the water quality reached equilibrium
  - Should high volumes of water be encountered (> 5 ℓ/s), Treatment strategies may include a greater or lesser degree of water treatment in order to render the water suitable for reuse. If there is still a residual water management problem, then the operation could evaluate and negotiate options with DWS for the discharge of such water to the water resource.

6.7. Air quality management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

- Carry out monitoring of respirable dust
- Implement and maintain a dust suppression system on the opencast haul road and service roads associated with the pits
- Install dust fall-out buckets at relevant positions
- Sample dust buckets associated with the pits on a monthly basis and implement corrective action as required
- Service vehicles regularly
- Suppress road dust when dust entrainment behind vehicles is noticeable
- Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed
- Wet suppression of roads, tailings and demolition waste will be done in the closure phase

6.8. Noise and vibration management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

- Announce all imminent blasts by means of a blast claxton/siren
- Carry out noise monitoring during the operational phase of the mine to ensure that noise mitigation is effective. Appoint independent noise specialist to carry out day time / night time noise monitoring every second year. First assessment to be carried out during first year of operation. Noise specialist to provide ECM with specialist advice on modification of acoustic berms if such berms prove to be ineffective
- Communicate blasting programme to the public and directly affected landowners (neighbouring farmers, residents of the local village) so that they can anticipate and/identify blasts as being part of the mining operation
- Construct earth berms before commencement of mining in order to screen the operational noise sources from the receiving public
- Develop and implement a blasting programme that defines a window of time when in the day blasting will occur. This has provisionally been planned for 13h00 – 14h00. ECM to obtain signoff from DMR for this blast management plan, specifically the implementation of special measures that may be required when blasting within 500 meters of the villages
- Ensure that the area has been made safe in terms of the Mine Health and Safety Act (500 m) that all people and livestock are outside of the blast exclusion zone (500 metres) prior to blasting
- Ensure the 500-metre blast exclusion zone is cleared prior to blasting, alternately as directed by the Department of Mineral Resources in the Mine Health and Safety Act/Occupational Health and safety Act
- Use electronic detonators whenever possible
- Wherever possible, all blasts at the Tweefontein section should involve sequential detonation of charges, rather than simultaneous detonation of all charges in order to reduce both noise and ground shock. The impact of blasting noise on people will not be a problem as there are no people near opencast areas
- Ensure that employees wear protective gear as needed

6.9. Visual aspects management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

- On completion of mining and successful rehabilitation of the mining area features could be removed and the footprint grassed, or it may be left intact, depending on agreement between ECM and the landowner

- Provide screening along the public road in the form of overburden dumps developed alongside roads in order to reduce visual intrusion. No screening will be applied near the Klarinet site due to its topographical nature
- Vegetate rehabilitated areas and the walls of the tailings dams not being reclaimed
- Vegetate screening walls

6.10. Archaeological and cultural interests management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.

- If archaeological sites identified are going to be impacted on by the mining operations, these sites have to be subjected to a Phase II investigation. A Phase II investigation of these sites would require that the archaeologist obtain a permit from the South African Heritage Resources Agency (SAHRA), which would also allow for the demolishing of the site after it has been subjected to the Phase II investigation. Small excavations may have to be conducted in the site in order to collect material from the site
- Inform all workers of the historical sites.
- Exhume and relocate graveyards that will be impacted by mining activities when needed.

6.11. Socio Economic Environment management measures for implementation

Please also refer to Appendix 6 and recommendations as outlined in Table 18-1.
The following is also proposed for implementation:

- Operational phase
  - Even though there is no guarantee of securing employment for the local people from the proposed mining activities, a detailed skills survey for the project area should be undertaken.
  - There is a need for a clear employment policy that is merit based, gender and race neutral and which offers opportunities for employee advancement.
  - Award bursaries to young people in local communities on condition that the bursary holders are available for vacation employment and apprenticeships.
  - Select young local people who possess good educational qualifications for apprenticeship positions.
  - Emphasise the indirect employment opportunities that will come from local contracting by the mine and from the increased local expenditure by mine employees.
  - Establish effective and timeous communication with community leaders.
  - Ensure that a transparent procurement process for the mine is adhered to at all times is critical. This should include a database of suppliers available in the areas surrounding the mine, as well as their training and support requirements.
  - Implementing an extensive and pro-active HIV/Aids policy and campaign.
  - ECM should make it clear (through advertisement) that no new recruitment will take place and the area should be patrolled to prevent possible squatting
  - Fencing around the opencast and underground mines area to be inspected weekly and maintained in competent condition.
  - Ensure that signs are erected on all boundary fences warning against entering mining area.
  - Security: Appropriate steps (e.g. upgrading of current security system) to be taken in consultation with other mines and relevant stakeholders.
  - Health: ECM's HIV/AIDS programme should include not only its employees, but also strive to provide community support. HIV/AIDS awareness programmes should be promoted, particularly among adolescents.
  - Pressure on existing infrastructure: ECM is to cooperate with GTLM in terms of its IDP to upgrade infrastructure in the area.
  - The number of local job opportunities is to be maximised. ECM (Samancor) to continue with current housing initiatives, including promotion of home ownership among employees,

facilitation of applications for RDP housing subsidies on behalf of employees, provision of housing loans for employees, abolishment of the hostel system, etc. ECM (Samancor) to continue with infrastructural support to selected schools to meet the needs of employees' children. ECM (Samancor) to continue providing health related services and medical schemes for mineworkers and their families.

- The most direct road haul routes should be selected where possible. ECM to support GTLM in terms of its IDP to upgrade and maintain local roads. ECM to give preference to maintenance of the R37 road, which is the main tar road passing all the affected communities. Upgrading may be undertaken as joint venture with other mines in the area. Contractors to comply with road signs and safety policy.
- ECM is to ensure that existing security fencing and barriers are sufficient to prevent unauthorized access to the premises.
- Educational and information programmes to be implemented at neighbouring schools to advise children on the risk of entering the mine site
- Can be further reduced through management of noisy equipment and light lighting and muted colour schemes.
- Sewage: As there are seven sewage plants in the area, no additional sanitation is required. Sewage will not be pumped into the Tubatse River.
- Water quality, noise and dust: The impacts on human health and mitigation measures are addressed in the relevant specialist studies.
- Preferential targeting of local employment, e.g. use local employment broker/special tendering arrangements
- Local employment to be maximised through training and capacity. Factors currently limiting employability of communities in the Steelpoort area should be addressed in the Social and Labour Plan. A defined percentage of staff should be recruited from the local area. Employment at the mine should be based on the principles of Employment Equity (incl. Mining Charter requirements in terms of women in mining).
- Re-skilling where necessary to insure continued employment of current staff
- Increase efficiency for implementation.
- Increase efficiency for implementation.
- Assist municipality to upgrade physical and social infrastructure.
- Refine procedures for implementation
- Direct through Social Investment fund and integrate activities with other industries in the area.
- Specific issues raised concerning the mine are contained in an independent Issues and Response Report in which comment is provided on each issue raised and, where relevant, a reference is given to indicate where in the approved EIA and EMPr document the issue of concern has been addressed.
- Provide an on-going means of communication with directly affected parties and ECM.
- A complaints and compliments register should be established and be kept at the mine site office in which any complaint or compliment received is documented, the party responsible for follow-up is indicated and the follow-up actions recorded.
- This register should be kept in an accessible area, probably at the mine administration office front desk.
- The mine manager and ECO must be apprised of any issues raised, within 24 hours of entry into the register. The ECO, in consultation with the mine manager will identify who is responsible to follow up on the issues raised. Contact to be made with the stakeholder within 48 hours of receipt of the issue, and feedback to be provided to the stakeholder that raised the issue, on close out of the issue. The timeframe that will be necessary to address the issue must be communicated during initial contact with the stakeholder.

- Closure phase
  - Retrenchment packages should be paid to workers that are retrenched.
  - Staff should be reallocated to other mines.

- Measures defined in the Social and Labour Plan in terms of reskilling prior to closure should be implemented.
- Re-focus and diversification should be facilitated in accordance with sustainable development principles
- Where possible employees must be assisted in finding employment at other sites.
- Rehabilitation should take account of sustainable development opportunities and should be formulated with the local community

In addition to the above, the following was identified by the 2020 assessment:

- Noise:
  - All vehicles must be in good working order and maintained;
  - The noise generating aspects and equipment must be confined to the project area approved by the DMR under the mining right authorization. Drilling and blasting is generally intermittent and should be limited to daylight hours when ambient noise levels are highest.
  - Personnel working within the plant must wear ear protection gear.
  - A complete blasting schedule and timeframes must be compiled and communicated with the adjacent communities to ensure that they are notified in advance prior to blasting taking place.
  - Operators must wear ear protection at all times when operating the earth moving equipment and machinery to prevent noise induced hearing loss. Noise pollution must be monitored monthly, and recorded throughout the life of mine.
- Air pollution:
  - Wetting of access roads;
  - Monitoring for dust and smog;
  - Protective clothing to be provided to employees;
  - Concurrent rehabilitation and vegetation of project sites;
- Light and Visual impacts:
  - Concurrent rehabilitation and screening of areas with vegetation;
  - Filling up the mining site to match the surrounding landscape as closely as possible in the final phase of rehabilitation;
  - Planting trees on the available fill material at a high density in the first phase of rehabilitation to match the “texture” of the surrounding landscape;
  - Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e. grey vs reddish brown).
  - Filling up the mining site to match the surrounding landscape as closely as possible in the final phase of rehabilitation;
  - Planting trees on the available fill material at a high density in the first phase of rehabilitation to match the “texture” of the surrounding landscape;
  - Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e. grey vs reddish brown).
- Land use and capacity:
  - Rehabilitate the land to as close as possible to its wilderness and grazing land state during and after the mining activities are concluded. Re-vegetation should be with indigenous plant species that are able to sustain the regional climate and soil conditions.
  - The farm where the current mining activities are taking place, is already a restricted/controlled access, therefore the larger SECM Tweefontein mining proposed activities will not reduce availability of natural resources and land to local communities.
- Cultural and Heritage:
  - Preserve sites of significance;
  - Monitor chance finds and report to LIHRA;

- Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist;
- Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in order to verify the presence or absence of any such material;
- Any graves in the vicinity of the mining operations will or not be directly affected must be documented and monitored for damage

- Crime, Covid-19 ad HIV
  - Labour should be sort from the local settlement areas to prevent influx of foreigners who are likely to disrupt the social fabric, values and norms of the village people.
  - Through the SLP and day-to-day training and awareness programmes pandemics such as HIV can be managed and minimized. The Tweefontein mine must also have an HIV awareness outreach programme in conjunction with local health centres and clinics to extend awareness and knowledge about the disease to the broader communities affected by the proposed mine activities.
  - Visible policing and community policing forums must be established to curb incidents of crime in the communities. This option must be implemented in conjunction with existing tribal authority processes to manage crime and illegal activities.
- Economic opportunities, infrastructure development and employment:
  - Subject to economic modelling and feasibility study, another concentrator plant in the vicinity of Tweefontein can further stimulate significantly the economic activity in Fetakgomo Municipality, Lebowakgomo and the surrounding region.
  - Labour should be sort from the local settlement areas to prevent influx of foreign people and job seekers who are likely to disrupt the social fabric, values and norms of the village people.

7. FINANCIAL PROVISION

7.1. Determination of the amount of Financial Provision

7.1.1. Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.

The closure objectives are outlined in Part B, Sections 4.1 and 4.2.3. The objectives includes statements on how the impacted area will be managed to align the rehabilitated area to the baseline environment as far as possible.

7.1.2. Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

The closure objectives were made available to I&APs when the documentation was made available for comment as per Part A, Section 7. As the land owner, Samancor Chrome Ltd undertakes to adhere to the objectives and requirements of the EMPr as per Part C of this report.

7.1.3. 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.

Based on the available information it is anticipated that there will be an opencast pit area that will not be backfilled during the closure phase. As far as possible (unless an agreement with new property owners or occupiers are reached) all infrastructures will be removed and the areas rehabilitated. Based on this the following is anticipated to remain on site after closure:

- Tailings storage facility 1;
- Tailing storage facility 2;
- Return water dam 1;
- Storm water dam 1;
- Tailings storage facility 3;
- Return water dam 3
- River diversion at TSF 3;
- Waste rock dump;
- Underground mined out areas; and
- Opencast pit.

7.1.4. Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The closure and rehabilitation of the Tweefontein section existing and new activities were considered during all phases of the development including the following aspects:

- Post-closure land use.
- Risk identification and addressing / mitigating the risks.
- Progressive closure.
- Implementation and monitoring.
- Social transition.

Based on the above and the closure objectives as outlined in this report it is believed that the final closure plan is a true reflection.

7.1.5. Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

The Financial Provisioning was determined by ECM for December 2019 and the scheduled closure costing was determined at R170 559 246,93 Excl. VAT for the existing operations and infrastructures on site. Based on the information provided by the Tailings retreatment contractors the additional financial provision for the new TSF was determined as R 739 289,20 Excl. VAT. Please refer to Part A, Section 26.1.

7.1.6. Confirm that the financial provision will be provided as determined.

The financial provision will be provided as determined, please also refer to the Undertaking by the application in Part C of this report.

8. MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON, INCLUDING

a) Monitoring of Impact Management Actions
b) Monitoring and reporting frequency
c) Responsible persons
d) Time period for implementing impact management actions
e) Mechanism for monitoring compliance

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**
All activities as identified	Air quality impacts as identified relating to dust	Part B, Section 8.1	SHEQ	Time periods for implementing management actions are outlined in Appendix 6 and Part B, Section 6 and 6 and Part A, Section 20
Waste generating activities	Quantities of waste generated	Part B, Section 8.2	SHEQ	Part B, Section 8.2
All activities as identified	Terrestrial biodiversity	Part B, Section 8.4	SHEQ	Time periods for implementing management actions are outlined in Appendix 6 and Part B, Section 6 and 6 and Part A, Section 20
All activities as identified	Terrestrial biodiversity	Part B, Section 8.4	SHEQ	
All activities as identified	Geohydrological	Part B, section 8.5	SHEQ	
All activities as identified	Surface water	Part B, Section 8.8	SHEQ	
All activities as identified	Noise	Part B, Section 8.6	SHEQ	
All activities as identified	Soil	Part B, Section 8.7	SHEQ	
All activities as identified	Socio Economic aspects	Part B, Section 8.10	Transformation	

A summary of monitoring report submission commitments and frequencies are provided below:

Timeframe	**Monitoring**
Quarterly reports or as required by the Water use licence 2016 or as amended	Surface water Quality monitoring results. Ground water monitoring results.
6 monthly reports reports or as required by the environmental auhtorisation and Water use licence 2016 or as amended	Noise monitoring.
Annual reports or as required by the environmental auhtorisation and Water use licence 2016 or as amended	Air quality monitoring for fallout dust as determined on a montly basis for the calander year. Updated water balance. Revision of the rehabilitation financial provision calculation, with an auditor's report on the amount available in the Trust. Alien invasive Species assessment (vegetation) Vegetation establishment on rehabilitated areas.
Biennial reports or as required by the environmental auhtorisation and Water use licence 2016 or as amended	Monitoring and performance assessment of the EMPr in accordance with the NEMA regulations as amended from time to time.

8.1. Air quality monitoring plan

The main pollutant that would need to be monitored is dust fallout as dust will be generated during the construction and operational phase. It is thus recommended that a dust fallout monitoring programme be initiated by the Tweefontein Section in alignment with the American Society for Testing and Materials standard method for collection and analysis of windblown dust deposition (ASTM D1739).

A meteorological station needs to be installed and maintained onsite. This unit will measure wind speed, wind direction, air temperature, barometric pressure and precipitation.

A monitoring program do exist for the current Tweefontein operations. Details of this can be found below in Table 8-1 and Figure 8-1. Proposed new locations as identified is also outlined in Table 8-1 and Figure 8-2.

It is recommended that the client should establish a fine particulate monitoring programme, specifically at the problem areas areas as visually observed on site during windy conditions. Handheld sampling instruments not only allows for sampling in the 8 main wind directions, but also on-site sampling down-wind of potential dust sources to quantify and determine impacts that need to be managed. It is advised to conduct this sampling on a monthly basis but also when the need arise during periods of elevated dust concentrations being emanated from the site.

Table 8-1: Current and proposed monitoring campaign dust fallout locations and results for 2019

Site			mg/m²/day					
Name	**X**	**Y**	**Jan-19**	**Feb-19**	**Mar-19**	**Apr-19**	**May-19**	**Jun-19**
North	30.122617	-24.891942	287	222	303	419	NA	466
North West	30.119377	-24.890465	104	184	271	384	266	288
West	30.117478	-24.888945	312	234	156	147	158	129
South West	30.114587	-24.890852	911	306	957	647	593	465
South	30.114107	-24.891937	550	459	183	351	99	244
South East	30.117869	-24.894107	1266	702	582	358	317	NA
East	30.12929	-24.895269	382	487	494	602	661	550
North East	30.123481	-24.893725	715	495	572	308	703	397
01	30.1228	-24.8681	New proposed monitoring locations					
02	30.1282	-24.882						
03	30.1299	-24.8953						
04	30.1176	-24.901						
05	30.1134	-24.897						
06	30.1133	-24.89						
07	30.1179	-24.8822						
08	30.1125	-24.8733						

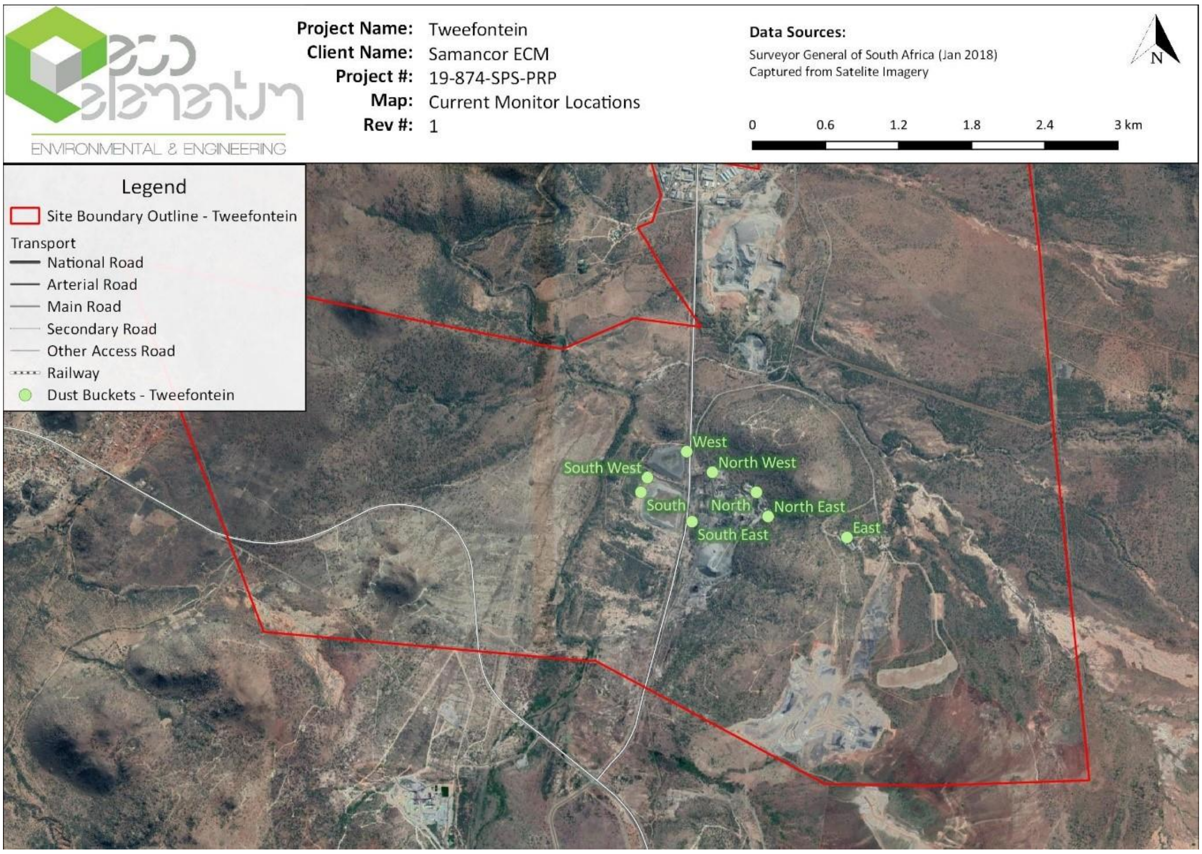
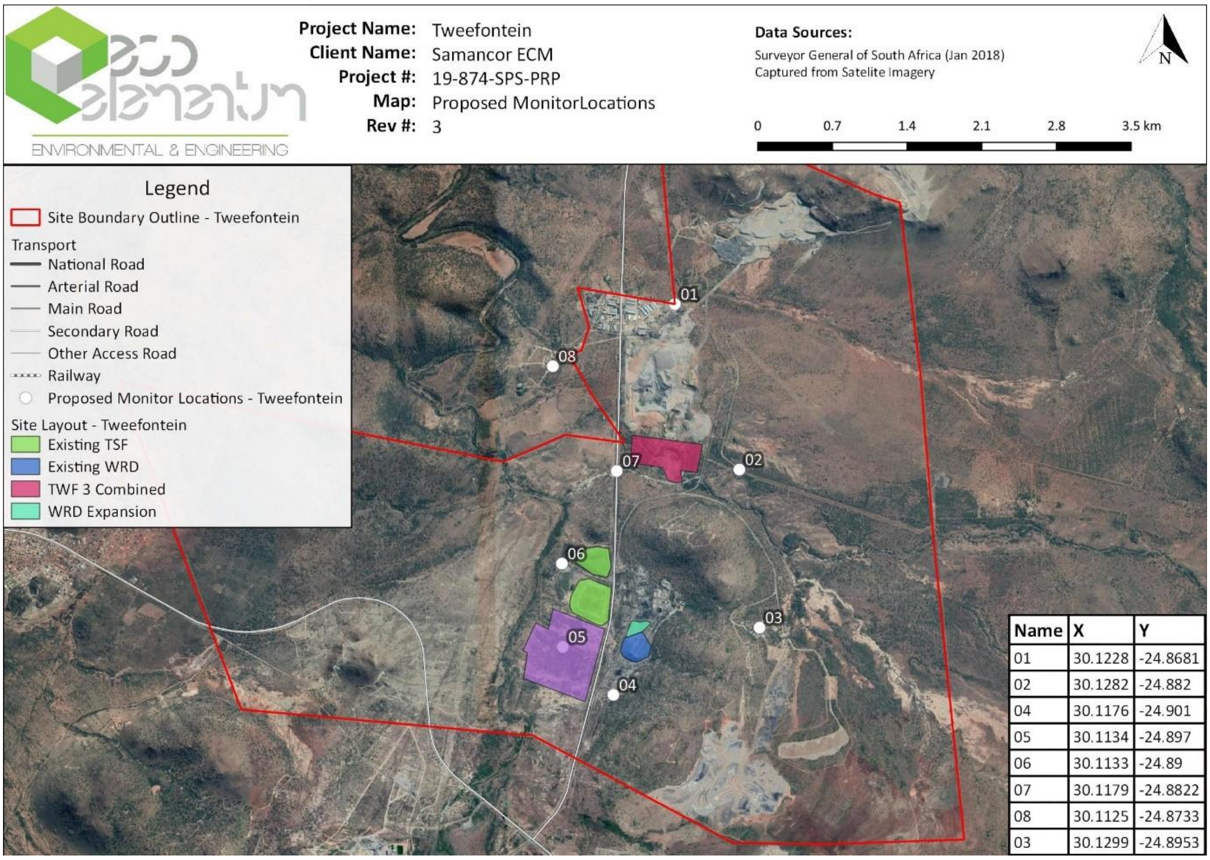


Figure 8-1: Current Monitor Locations



Name	X	Y
01	30.1228	-24.8681
02	30.1282	-24.882
04	30.1176	-24.901
05	30.1134	-24.897
06	30.1133	-24.89
07	30.1179	-24.8822
08	30.1125	-24.8733
03	30.1299	-24.8953

Figure 8-2: Proposed new air quality monitoring points

8.2. Waste monitoring plan

- The tons and volumes of waste rock deposited and removed from the waste rock stockpile area. The totals need to be provided on a monthly basis
- Volume of used oil removed from site. The totals need to be provided on a monthly basis
- General waste removed from the site by the appointed contractor. The totals need to be provided on a monthly basis
- Volume of sewage removed from septic tanks by the appointed contractor
- The volumes of tailings deposited on the operational tailings dam
- The volume of tailings and source of tailings used at the tailings retreatment plant as part of the re-treatment project
- Weight / Volumes of general waste removed from site

8.3. Archaeological monitoring plan

No monitoring requirements were identified.

8.4. Terrestrial biodiversity monitoring plan

The establishment of vegetation during all mining phases needs to be investigated for the presence of alien invasive species. This assessment should be done on a yearly basis. The area to be invested should include the riparian vegetation of the Dwars River. The Annual alien invasive plant monitoring, eradication and control programme should be monitored.

Annual terrestrial ecology monitoring of surrounding areas to determine if vegetation in undisturbed areas is being impacted. Photographic record of monitoring sites should be kept for comparison between monitoring events.

During continuous rehabilitation vegetation establishment on rehabilitated areas need to be monitored annually. During the post closure phase monitoring of vegetation is proposed on an annual basis and every 2 years until it is self-sustaining and a closure certificate is obtained.

Implement an Observe and Report approach which will enable employees to report any disturbance of fauna or degradation that they encounter during the operational phase.

8.5. Geohydrological Monitoring plan

ECM will monitor the identified groundwater monitoring points for the parameters as outlined in Condition 4.2 on page 16 of the Water Use Licence dated 2016 or as amended.

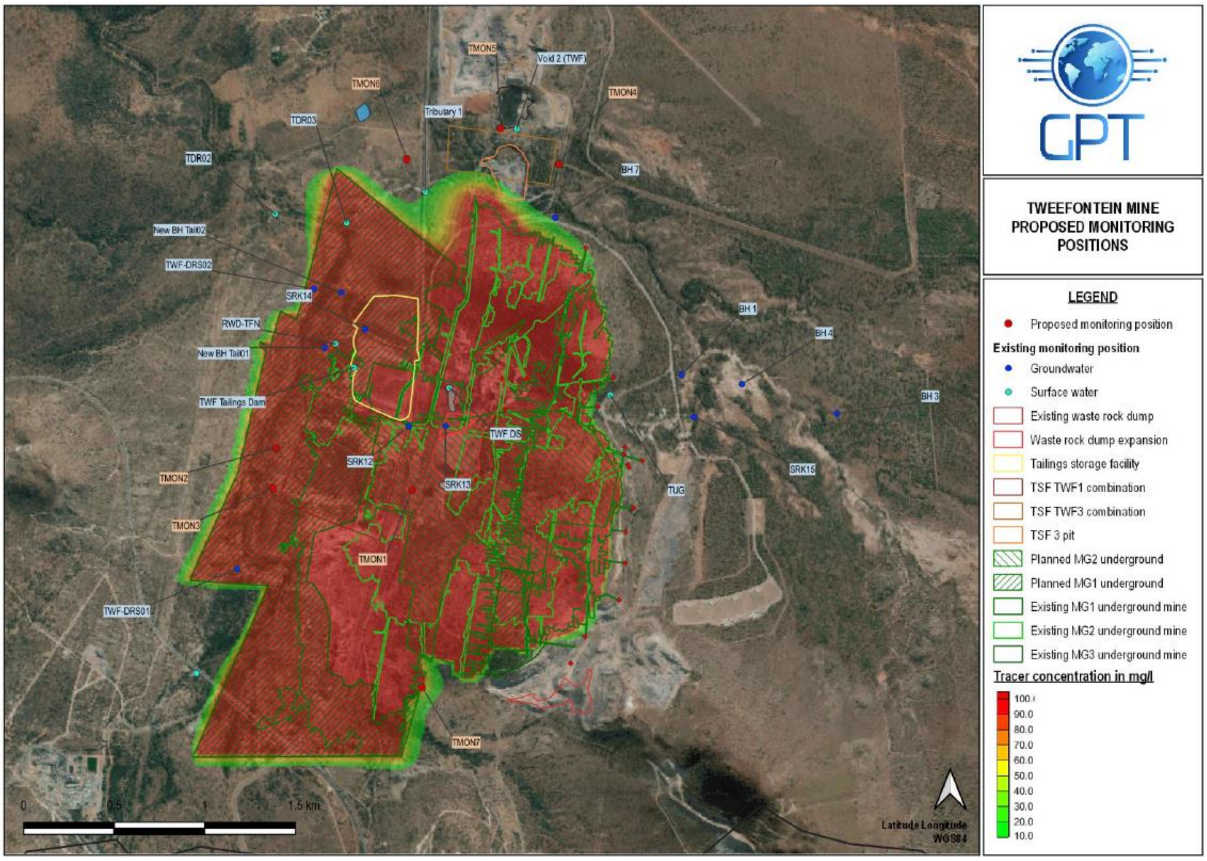


Figure 8-3: Existing and proposed groundwater monitoring points

Table 8-2: Existing and proposed groundwater monitoring points (quarterly basis)

Site name	Y co-ordinate	X co-ordinate	Description
BH 1	-24.89273	30.131905	Borehole
BH 3	-24.894827	30.140436	Borehole
BH 4	-24.893248	30.135237	Borehole
BH 7	-24.884092	30.125021	Borehole
New BH Tail01	-24.891163	30.112429	Next to Tailings Complex
New BH Tail02	-24.88816	30.113276	Next to Tailings Complex
SRK11	-24.895542	30.119001	Next to Waste Rock Dump
SRK12	-24.895535	30.117033	Next to rock waste dump
SRK13	-24.895544	30.11902	Borehole
SRK14	-24.890179	30.114582	Between new and old tailings dam
SRK15	-24.895006	30.132631	Next to sewage plant
TWF-DRS01	-24.903261	30.107584	Undermining Monitoring Borehole1
TWF-DRS02	-24.888035	30.111797	Undermining Monitoring Borehole2
TMON1	-24.899	30.11717	Proposed monitoring around proposed site TWF1
TMON2	-24.8967	30.10972	
TMON3	-24.898912	30.109567	
TMON4	-24.881189	30.125197	Proposed monitoring around proposed site TWF3
TMON5	-24.879276	30.122023	
TMON6	-24.880932	30.116887	
TMON6	-24.909773	30.117723	Proposed Monitoring of WRD

8.6. Noise

Measurements to be made using the equivalent continuous A-weighted sound pressure level, LAEQ,I, in accordance with the South African Bureau of Standards (SABS) code of practice for noise measurement and assessment, SANS 10103:2008.

The number of complaints with regards to noise must be logged, including the name of the receptor, the location, nature of sound and the time when the noise were experienced. Once-off noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument can be deployed at the mine (close to the source of noise) during the measurement.

Bi-annual noise monitoring should take place over a 24 hour period at the location of the two closest receptors.

8.7. Soil

As it is proposed to do continuous rehabilitation, the following are recommended:

- Monitoring and quality control of the stripping and stockpiling process:
    - Ensure that topsoil and subsoil is stripped and stockpiled separetely
- Monitoring of the placement of subsoil and topsoil above the cover layer:
    - Ensure that the subsoil is placed below the topsoil material to mimic the organic soil provide
- Monitoring of the fertilisation and seeding process;
- Once germination and vegetative cover is established, monitoring of species composition and basal cover is recommended on an annual basis;
- Ad-hoc inspections after severe rainfall to determine soil loss and vegetative cover;
- Remediating actions like reseeding etc. to re-establish basal cover;
- Some sub-climax and climax species germinate after two to three years in a disturbed environment. The success of long term seeding (basal cover and specie composition) can only be judged after three years.

8.8. Surface water

Effective surface water management and monitoring is essential for the long term sustainability and protection of the receiving water environment. There is a legal obligation on the water user to establish a monitoring programme on the site that needs to be registered on the National Monitoring System administered by D: RQS. This would enable the mine and the DWA to collect data and information necessary to assess:

- Quantity, quality and use of water in the Dwars River;
- Quantity, quality and use of water in the unnamed tributaries;
- Compliance with RQO;
- Status of the aquatic health system; and
- Atmospheric conditions which may influence water resources in the area.

Water quality monitoring parameters as indicated in Condition 4.2 on page 16 of the Water Use Licence dated 2016 or as amended will be monitored on a monthly frequency during the various phases of the mine.

Five possible watercourse quality and quantity monitoring points as indicated below is conducted on site. Monitoring of the proposed monitoring points should be initiated during all phases of the mine life

Table 8-3: Natural surface water monitoring locations

Site name	Y co-ordinate	X co-ordinate	Description
TDR01	-24,909023	30,105438	Dwars River above abstraction
TDR02	-24,883884	30,109697	Dwars River below abstraction
TDR03	-24,884432	30,113605	Klarinet & TWF Opencast
Tributary 1	-24,88266	30,117895	TWF Tributary
Tributary 2	-24,86323	30,11839	Klarinet Tributary

Though there are stream diversions the limited habitat types in these non-perennial streams make it unsuitable for bio-monitoring (SASS5). However bio-monitoring must be conducted in the Dwars River upstream and downstream of the mine as per the requirments of the Water Use Licence dated 2016 or as amended.

It is also proposed (in alignment with DWS protocol) that toxicity analyses of the return water dam water be done, however it is proposed that this only be done bi-annually (wet season and dry season), It is also proposed that of the toxicity monitoring indicate no toxicity that sampling be stopped after 2 years.

In addition, monitoring of the water quality in the storm water / return water dam and Void 2 as well as the water pumped from underground will be done on a quarterly (October, January, April, July) basis and include the variables as specified above. The water quality (as per condition 4.2 on page 16 of the Water Use Licence dated 2016 or as amended) will be representative of:

- Seepage/run off from the mining areas;
- Dewatering of the open pit(s); and
- Run off from the waste rock dump.

The following points also need to be monitored:

<table>
<tr><td>Water levels of return water dam</td><td rowspan="2">Daily</td></tr>
<tr><td>Water levels of Void 2</td></tr>
<tr><td>Volume of waste rock generated</td><td rowspan="8">Daily, to be totalled each month</td></tr>
<tr><td>Water pumped from the storm water / Return water dam to the plants and mining areas</td></tr>
<tr><td>Water inflow to the plants</td></tr>
<tr><td>Water pumped from the opencast to Void 2</td></tr>
<tr><td>Volume of water abstracted from boreholes</td></tr>
<tr><td>Volumes of water pumped from underground mining areas to the surface</td></tr>
<tr><td>Sewage volumes generated on site</td></tr>
<tr><td>Inflow of water into the Return water dam (from silt trap area)</td></tr>
<tr><td>Water quality in the Return water dam (to be compared agains Table 6 on page 15 of the Water Use Licence dated 2016 or as amended)</td><td rowspan="2">Quarterly</td></tr>
<tr><td>Water quality in the TFT dam (Void 2) (to be compared agains Table 6 on page 15 of the Water Use Licence dated 2016 or as amended)</td></tr>
<tr><td>Discharges from the Return water dam to the Dwars River</td><td>Weekly if occurring</td></tr>
</table>

In addition to the above the following is recommended as per Table 8-4.

Table 8-4: Additional Surface water monitoring requirements as a result of the expansion activities

<table>
<tr><th>Location</th><th>Aspect</th><th>Parameters</th><th>Frequency</th></tr>
<tr><td>River diversion in unnamed tributary</td><td>Vegetation establishment and alien invasive plant determination</td><td>Vegetation cover and vegetation species</td><td>Annually</td></tr>
<tr><td rowspan="2">River diversion in Unnamed tributary – upstream of TSF</td><td>Groundwater quality</td><td rowspan="2">as per condition 4.2 on page 16 of the Water Use Licence dated 2016 or as amended</td><td>Every 3 months</td></tr>
<tr><td>Surface water quality when flowing</td><td>Every 3 months</td></tr>
</table>

Location	Aspect	Parameters	Frequency
and associated infrastructure			
River diversion in unnamed tributary – downstream of TSF and associated infrastructure	Groundwater quality		Every 3 months
	Surface water quality when flowing		Every 3 months
Storm water dam(s)	Overflow Water quality	Table 6 on page 15 and Condition 4.2 on page 16 of the Water Use Licence dated 2016 or as amended	Daily
	Water levels	Free board	Daily
	Overflow volume	Volume	Daily
TSF and associated infrastructure	Rainfall		Daily
	Water balance		Monthly
	Toe seepage water Quality	Table 6 on page 15 of the Water Use Licence dated 2016 or as amended	Every 3 months
	Toe seepage volume	Volume	Monthly
	Water infiltration to TSF	Volume	Monthly
	Vegetation establishment on TSF		Annually Post closure

8.9. Visual

The area around the Tweefontein mine can be described as having undulating hills. Although the area surrounding the Tweefontein Mine is generally featureless, there are factors influencing the visual quality of the Tweefontein, including existing mining activities within the area. The naturally undulating topography may aid in obstructing views towards the proposed expansions from respective directions, resulting in the visual quality being rated as low due the short time of the proposed activity will be undertaken. As a result of this no visual monitoring is proposed.

8.10. Socio-Economic

Monitoring for environmental aspects that could impact on the socio economic environment as outlined in the preceding sections. The following is also recommended for monitoring by Human Resources annually:

- The number of people sourced from the local communities that is employed by Tweefontein;
- Implementation of the SLP; and
- Minutes of meetings with the Community leaders and liaisons

9. INDICATE THE FREQUENCY OF THE SUBMISSION OF THE PERFORMANCE ASSESSMENT REPORT

Regulation 26(e) of GN326 of 2017 indicate that "*the frequency of auditing of compliance with the conditions of the environmental authorisation and of compliance with the approved EMPr, and where applicable the closure plan, in order to determine whether such EMPr and closure plan continuously meet mitigation requirements and addresses environmental impacts, taking into account processes for such auditing prescribed in terms of these Regulations: provided that the frequency of the auditing of compliance with the conditions of the environmental authorisation and of compliance with the EMPr may not exceed intervals of 5 years*"

ECM will conduct external performance assessments on the EMPr every 2 years, these reports will be submitted to the DMRE within a month of being completed.

10. ENVIRONMENTAL AWARENESS PLAN

10.1. Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

No	Activity / Procedure	Roles and responsibility
1	GENERAL	
1.1	Awareness training must include the potential consequences of departure from specified operating procedures as well as significant environmental impacts, actual or potential, of their work activities.	Human Resources Development
1.2	Training will be appropriate to the activity of individual employees.	Human Resources Development
2	INDUCTION PROGRAMME	
2.1	Training programmes shall, be established and maintained for mine personnel, contractors and visitors.	Environmental Superintendent and HRD Superintendent.
	Training shall include the following:	
	• Administrative requirements and procedures which will include the Emergency Procedures.	
	• Resource conservation and environmental reporting and general environmental awareness for mine related environmental issues.	
2.2	Contractors that are employed on the mine must, prior to any starting of working activities, complete the safety file/pack. This package requires the contractor to perform Safety, Health and Environment (SHE) Risk assessments on the activities to be undertaken. The entire risk assessment process and the applicable procedures are referenced within the contractor's safety file.	SHEQ Superintendent
2.3	Environmental Induction slides/presentation shall be revised annually.	All employees and contractors
	Induction is valid for the period of one year hence refresher shall be done after 365 days or following annual leave.	
2.4	Reporting of oil spills and incidents shall form part of induction program.	Environmental Superintendent
3	TRAINING NEEDS	
3.1	Training and awareness needs shall be identified as per the significant impact per job category.	HRD Superintendent and Section Heads
	Training needs shall be identified through:	
	• Performance appraisal;	
	• Analysis of non-conformances and incidents;	
	• Audit findings and recommendations;	
	• At time of recruitment (in the work place);	
	• Training needs analysis;	
	• Impact/Aspect Register	
	• Additions to scope in services provided;	
	• The updating of procedures (quality, technical and administrative).	
	Training needs will also be identified through work performance, request by employee and work area.	
3.2	Once training needs have been established it is up to the supervisor to notify the Training Department of the requirements. The training department will then identify pertinent and relevant courses (if not already done so by employee/supervisor) and schedule training accordingly.	HRD Superintendent and Section Heads
3.3	A training matrix will be generated from Training needs analysis.	Environmental Superintendent, Section Heads and SHEQ

No	Activity / Procedure	Roles and responsibility
	Monthly Environmental Theme/Topic will be distributed to all in the mine including contractors.	Coordinators
3.4	Environmental related awareness days celebrations are done to enhance awareness to employees and local communities (Water week, environmental Week, Arbour week etc.) to communicate environmental tips to all employees.	Environmental Superintendent
4	TRAINING PLANNING	
4.1	Identified and agreed training needs shall be included in budgets and processed as described below. Course attendance (other than at the internal induction courses) shall be scheduled on the basis of the importance of task contribution to the maintenance, effectiveness and improvement of the objectives.	Section Heads
4.2	Training expenses, including conferences and symposia would be checked and approved by the Head of Department. The HR Department shall complete a course authorisation form and ensure that the procedures are followed regarding course bookings, confirmations and payments.	Section Heads and
4.3	The Trainee shall :	HODs
	• Obtain approval from the Head of Department	
	• Request Training Department to make official booking.	
4.4	External training courses shall be assessed through :	HRD Superintendent and Section Heads
	• Attendance by, and the formal reports and recommendations of, staff	
	• Recommendation by known competent external personnel	
	• Review of course content, presenters, location and facilities by knowledgeable personnel	
5	EMS TRAINING	
5.1	*Mine Personnel:*	HRD Superintendent
	All employees, current or new, and contractors will undergo induction, a part of which is environmental awareness training and includes the Safety, Health, Environmental and Quality policy. Depending on a person's job category training will be performed on significant aspects pertinent to his/her area of work. At the end of this training, personnel will be required to complete the awareness test and the level of awareness assessed by the Training Department. Re-testing or induction may be required if test was failed.	
	All personnel performing tasks which can cause significant or major environmental impacts shall be competent on the basis of training, education and/or experience.	
5.2	*Visitors:*	Site Safety Officer or host
	All visitors to any controlled access areas of the Mine will undertake a short "visitors' induction", which highlights the main safety and environmental aspects relevant to short term visitors at the mine.	
5.3	*EMS Representatives:*	Management representative and activity manager
	Senior managers and management representatives shall have additional EMS knowledge requirements. The EMS senior managers and management representatives shall receive the training required to manage the EMS efficiently in their areas of responsibility. Such skills include the operation of the SHEQ incident register and action management electronic database (IMS and Chrome.doc), as well as thorough knowledge of the environmental procedures.	
5.4	*Standard Procedures:*	Environmental Superintendent
	Employees and contractors shall be made aware of Environmental Standard Operating procedure related to their activities which might have environmental impacts e.g. waste management, oil management etc.	
5.5	*Evaluation and Competence:*	Section Heads

No	Activity / Procedure	Roles and responsibility
	Definition: The HR Department and Section Heads role is to ensure that all mine regulations and procedures required by the various indicated legislation are such that theoretical knowledge and operational skills all pivot around competency. A competent person means a person who:	
	1. a) is qualified by virtue of his/her knowledge, training, skills and experience to organise the work and its performance;	
	b) is familiar with the provisions of legislation applicable to his/her work;	
	c) has been trained to recognise any potential or actual danger (significant aspects) to the environment, but also safety and health, in the performance of the work; and/or	
	2. is in the possession of the appropriate certificates of competency where such certificate is required by these regulations or legislations.	
	• Competency does not merely mean showing or training an employee on a task so that he knows how to do it.	
	• Proving competency, the employee must know the Who, What, When, How and Why pertaining to the task as well as the hazards and risks associated with performing the task.	
	Capacity and awareness training will be carried out by Environmental Coordinator and HRD Manager and evaluation of awareness and competency training (implementation of training in the work place) will be carried out by the Section Heads through PTOs or through approved accredited training providers. Awareness and competence will also be reviewed during audits, events of an emergency, and incident. Typical competence assessments include training programmes both formal and informal, PTOs, questioning employees, experience, checklists, qualifications and ability to do the work. Gaps identified shall be referred to HR Department.	

10.2. Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

All the risks identified (i.e. impacts that could occur) will be managed and prevented in accordance with the management and mitigation measures as outlined in the EMPr.

11. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

(Among others, confirm that the financial provision will be reviewed annually).

The financial provisions will be reviewed and updated in accordance with the applicable legislation as promulgated and updated from time to time.

No additional information has been requested.

- End of Part B -

PART C
UNDERTAKING

1. EAP UNDERTAKING

The EAP 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;

Name of EAP: Christina Petronella Erasmus

Date: ………………………………………………....

Signature: ……………………………………………

2. APPLICANT UNDERTAKING

I, ……, the undersigned and duly authorised thereto hereby:

a) Confirm that the financial provision as required will be available; and
b) Undertake to adhere to the requirements and to the conditions as set out in the EMPr submitted to the Director: Mineral Development and approved on ………………………………………

Signed at..on this........................... day………………………………

Signature of applicant …………………………………….

Designation …………………………………………………

- END OF PART C -

PART D
REFERENCES AND APPENDICES

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2. APPENDICES

Appendix 1: Qualifications of the EAP

Appendix 2: Experience of the EAP

Appendix 3: Locality Maps

Appendix 4: Site Plan and other Layout Maps

- Proposed alternative sites investigated
- Final site map with buffers and sensitivities
- Final site layout plan (no buffers and sensitivities)

Appendix 5: Public Participation Documentation

Public Participation report - with

- Content of Newspaper Advertisement and Site notices
- Newspaper Advertisement
- Background Information Document
- Photographs of Site Notices

Appendix 6: Impact Assessment Table with mitigation measures

Appendix 7: Specialist reports

- Civil Engineering Reports:
    - TSF and River Diversion Design Report;
    - WRD Expansion and Storm water assessment Report;
- Socio-Economic impact assessment 2021;
- Groundwater impact assessment 2021;
- Surface water impact assessment 2020;
- Fauna and Flora impact assessment 2020;
- Noise impact assessment 2020;
- Soil impact assessment 2020;
- Visual impact assessment 2020;
- Archaeological impact assessment 2020; and
- Air quality impact assessment 2020.