

DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED TAILINGS AND RETURN WATER
PIPELINES BETWEEN MOOINOOI AND LESEDI SECTIONS FOR SAMANCOR CHROME LIMITED-
WESTERN CHROME MINES

For

Samancor Chrome Limited
Western Chrome Mines
Mooinooi Section (RDNW 6/2/2/2701)

Located on:

Portions 155, 156, 157, 159,160 and 161 of the farm Elandskraal 469 JQ; and
Portions 35 and 12 of the farm Buffelsfontein 465 JQ
Madibeng Local Municipality
North West Province

Submitted for: Public Review and Comment

12 March 2021 – 16 April 2021

Ref: MOOINOOI - LESEDI PIPELINES

Basic Assessment Report Compiled by:



P.O. Box 2544

Montana Park

0159

Tel: 012 543 3808

Fax 086 621 0294

E-mail: info@prescali.co.za





Title:

Draft Basic Assessment Report for the proposed tailings and return water pipeline between Mooinooi and Lesedi Section (RDNW 6/2/2/2701) for Samancor Chrome Limited Western Chrome Mines located on Portions 155, 156, 157, 159,160 and 161 of the farm Elandskraal 469 JQ; and Portions 35 and 12 of the farm Buffelsfontein 465 JQ, Madibeng Local Municipality, Bojanala Platinum District, North West Province.

Client:

Samancor Chrome Limited
Western Chrome Mines
P.O Box 245
Mooinooi
0325

Telephone: 014 574 6051
Fax Number: 014 574 3538

Report no.:

Samancor/WCM/MN-LS-Pipeline/BAR/2021/V1

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



DOCUMENT CONTROL

	Name	Signature	Date
Compiled:	Dr Petro Erasmus <i>(Pri.Sci.Nat)(EAPASA)</i>		2020-12-15
Checked:	Mr. Gregory Netshilindi <i>(Cand.Nat.Sci)</i>		2020-12-17
Authorized:	Ms Elaine van der Linde <i>(Pri.Sci.Nat)</i>		2020-12-22

Approved for submission by Samancor Chrome Ltd:

Designation:

Signature:

REVISION AND AMENDMENTS

Description of Revision / Amendment	No	Date
Mooinooi Section Basic Assessment Report (DRAFT) – For Public Participation	0	2021/03/08
Mooinooi Section Basic Assessment Report – For submission to DMRE	1	

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mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

**DRAFT BASIC ASSESSMENT REPORT
AND
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT**

Draft Basic Assessment Report for the proposed tailings and return water pipeline between Mooinooi and Lesedi Section (RDNW 6/2/2/2701) For Samancor Chrome Limited Western Chrome Mines

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: WESTERN CHROME MINES - MOOINOOI SECTION

TEL NO: 014 574 6051

FAX NO: 014 574 3538

POSTAL ADDRESS: P. O Box 245, MOOINOOI, 0325

PHYSICAL ADDRESS: THE FARM ELANDSKRAAL 469 JQ, WESTERN CHROME MINES, MOOINOOI, 0325

FILE REFERENCE NUMBER: RDNW 6/2/2/2701



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 a 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 BASIC ASSESSMENT PROCESS

The objective of the basic assessment process is to, through a consultative process—

- (a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- (b) identify the alternatives considered, including the activity, location, and technology alternatives;
- (c) describe the need and desirability of the proposed alternatives,
- (d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
 - (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
 - (ii) the degree to which these impacts—
 - (aa) can be reversed;
 - (bb) may cause irreplaceable loss of resources; and
 - (cc) can be managed, avoided or mitigated;
- (e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
 - (i) identify and motivate a preferred site, activity and technology alternative;
 - (ii) identify suitable measures to manage, avoid or mitigate identified impacts; and
 - (iii) identify residual risks that need to be managed and monitored.



EXECUTIVE SUMMARY

Samancor Western Chrome Mine (WCM) has a mining right (DMR Ref No. NW30/5/1/2/2//481 MR and NW30/5/1/2/2/482 MR) for the Mooinooi Section and for the Lesedi Section (DMR Ref No. ML88/2003) for the underground mining of chrome in terms of the Minerals and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002, as amended).

Both Mooinooi and Lesedi are fully operational mining areas, though the underground operations at Lesedi has not commenced as yet after the closure by the previous owners International Ferro Metals South Africa (IFMSA).

The current operational tailings dam at Lesedi Section is reaching its capacity and a new depositing area is needed. Mooinooi Section is currently in the process of applying for an expansion of the existing TSF at Mooinooi Section and this area was identified as the preferred site for the deposition of tailings generated by the Lesedi Tailings retreatment plan.

Various routes for the proposed return water (Mooinooi to Lesedi) and Tailings (Lesedi to Mooinooi) were identified and the proposed option for implementation is either Pipeline Final or Option Alt4 both of which will cross the Buffelsfonteinspruit either on 161 of the farm Elandskraal 469 JQ or on Portion 35 of the farm Buffelsfonteins 465 JQ. The final route implemented will depend on the outcome of the negotiations with the respective property owners.

The preferred route will cover a length of approximately 2 940 m and it is expected that 2 940 m² will be disturbed. The following listed activities were identified:

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORIZATION
(E.g. For prospecting – drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route)	Ha or m ²	(Mark with an X where applicable or affected)	GNR LN1: 327 / LN2 325 / LN =3: 324 (07 April 2017)	(Indicate whether an authorization is required in terms of the Waste Management Act). (Mark with an X)
Development of a water and slurry pipeline with a diameter of more than 0.36 m and a throughput capacity greater than 120 l/second. <ul style="list-style-type: none"> • Inside a road reserve; • Outside a road reserve. The diameter of the pipeline will be 160 mm and the throughput capacity will be 170 m ³ /h.	3.23 km 3 230 m ² 1.923 km 0.724 km	N/A	LN1#10	
Vegetation removal for the proposed pipelines inside a road reserve – linear activity.	1.923 km 1 923 m ²	X	LN3#12	
Vegetation removal for the proposed pipelines outside a road reserve – Linear activity.	0.724 km 724 m ²	X	LN3#12	
Watercourse crossing for the proposed pipelines – footprint less than 100 m ² but more than 10 m ² in an existing road reserve. This will require a water use licence in terms of Section 21(c) and (i). It is anticipated that more than 10 m ³ of material will be moved within the affected watercourse.	40 m ²	X X X	LN3#14 LN1#34 LN1#19	
Phased activities. This includes the vegetation removal, pipeline construction.	0.33 Ha	X X	LN1#67 LN3#26	



Surrounding the proposed pipeline is an informal settlement (Pikinien), wilderness land, mining and industrial related uses and agricultural fields.

Various impacts on the natural environment have been identified and the following specialist studies were conducted:

- Pump and pipeline design;
- Heritage and Archaeological;
- Surface water;
- Soil and Land Capability;
- Visual; and
- Biodiversity (Fauna and Flora).



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PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 Details of:

1.1.1 *The 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

1.2 Expertise of the EAP

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 *Pri Sci Nat.* (SACNASP), Natural Professional Scientist, for Ecological and Environmental Sciences. She is also registered with EAPASA as an Environmental Assessment Practitioner. Her qualifications are provided in Appendix 1.

Reviewers:

- Mr Gregory Netshilindi has qualifications in Environmental & Geographical Sciences and Geological Sciences. He is a *Cand.Nat.Sci.* (SACNASP), Natural Professional Scientist for geological sciences. His qualifications are provided in Appendix 1.
- 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 and as an Environmental Assessment Practitioner (EAP) with EAPASA. Her qualifications are provided in Appendix 1.

1.2.2 *Summary of the EAP's past experience.*

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

- Dr. P. Erasmus has 14 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 (DWAFF);
 - M2 Environmental Connections (Pty) Ltd; and
 - Prescali Environmental Consultants (Pty) Ltd.

Reviewers:

- Mr. G. Netshilindi has 4 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; and
 - Prescali Environmental Consultants (Pty) Ltd
- Ms. E. van der Linde has 21 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 (DWAFF);
 - Groundwater Consulting Services CC;
 - M2 Environmental Connections CC; and
 - Prescali Environmental Consultants (Pty) Ltd.



2 LOCATION OF THE OVERALL ACTIVITY.

The location details of the proposed pipeline route are outlined below.

Farm Name:	Elandskraal		Buffelsfontein	
Farm Number:	469		465	
Registration Division:	JQ		JQ	
Portions:	155, 156, 157, 159, 160, 161		35, 12	
Administrative District:	Pretoria		Pretoria	
SG Codes	T0JQ00000000046900155 T0JQ00000000046900156 T0JQ00000000046900157 T0JQ00000000046900159 T0JQ00000000046900160 T0JQ00000000046900161		T0JQ00000000046500035 T0JQ00000000046500012	
Application Area (Ha):	Final Route	Option Alt4	Final Route	Option Alt4
	2.322 km – 0.23 Ha	2.213 km – 0.2213 Ha	0.916 km – 0.09 Ha	1.025 km – 0.1025 Ha
Distance and Direction from Nearest Town:	2.6 km North East from Mooinooi		3.8 km North East from Mooinooi	
Magisterial District:	Brits (Bojanala Platinum District Municipality)		Brits (Bojanala Platinum District Municipality)	
Locality Map:	Attach a locality map at a scale not smaller than 1:250000. (See Locality map append as (APPENDIX 2))			

3 LOCALITY MAP

(Show nearest town, scale not smaller than 1:250000). Please also refer to Appendix 3.

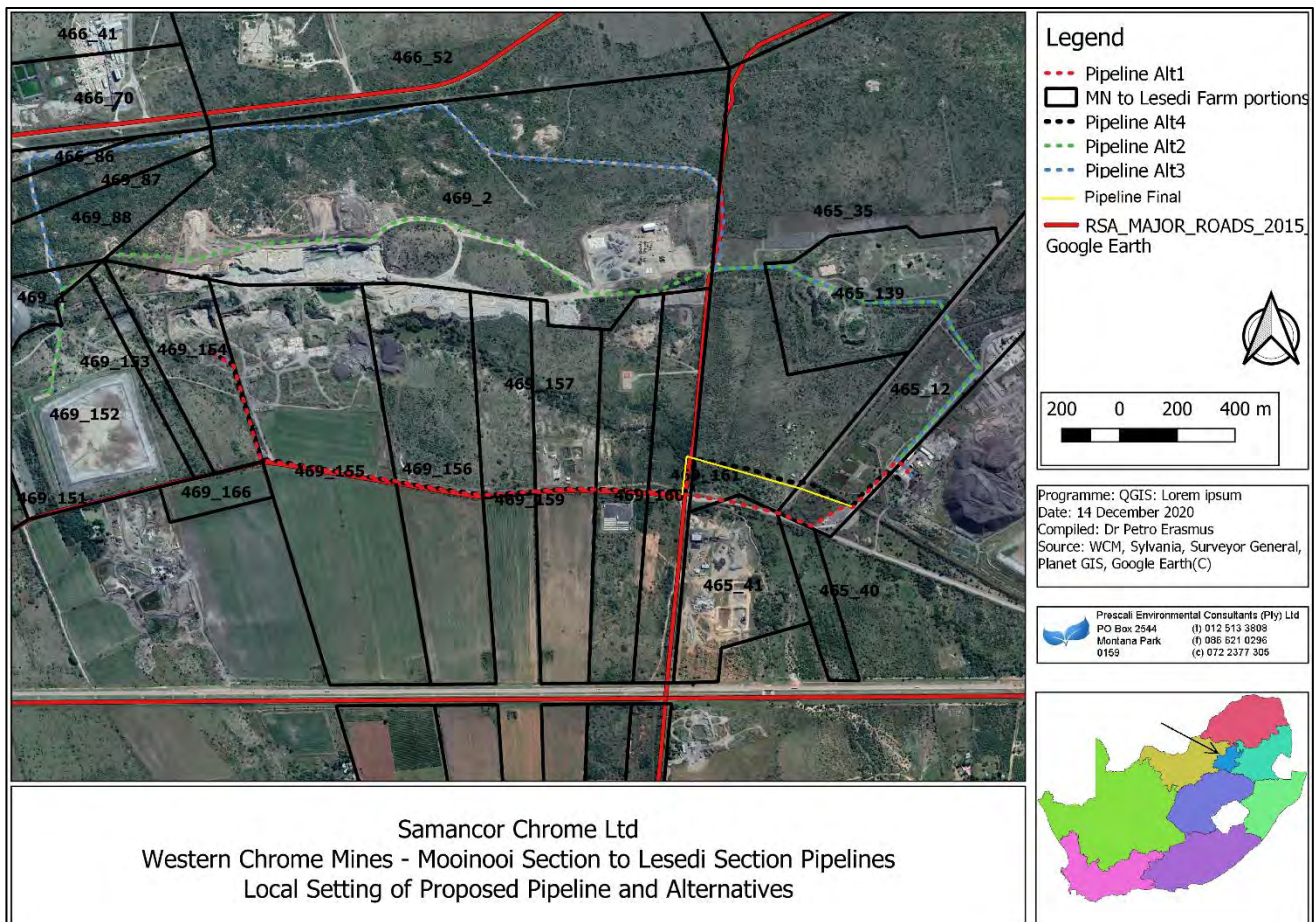


Figure 3-1: Mooinooi - Lesedi Pipelines Locality Map

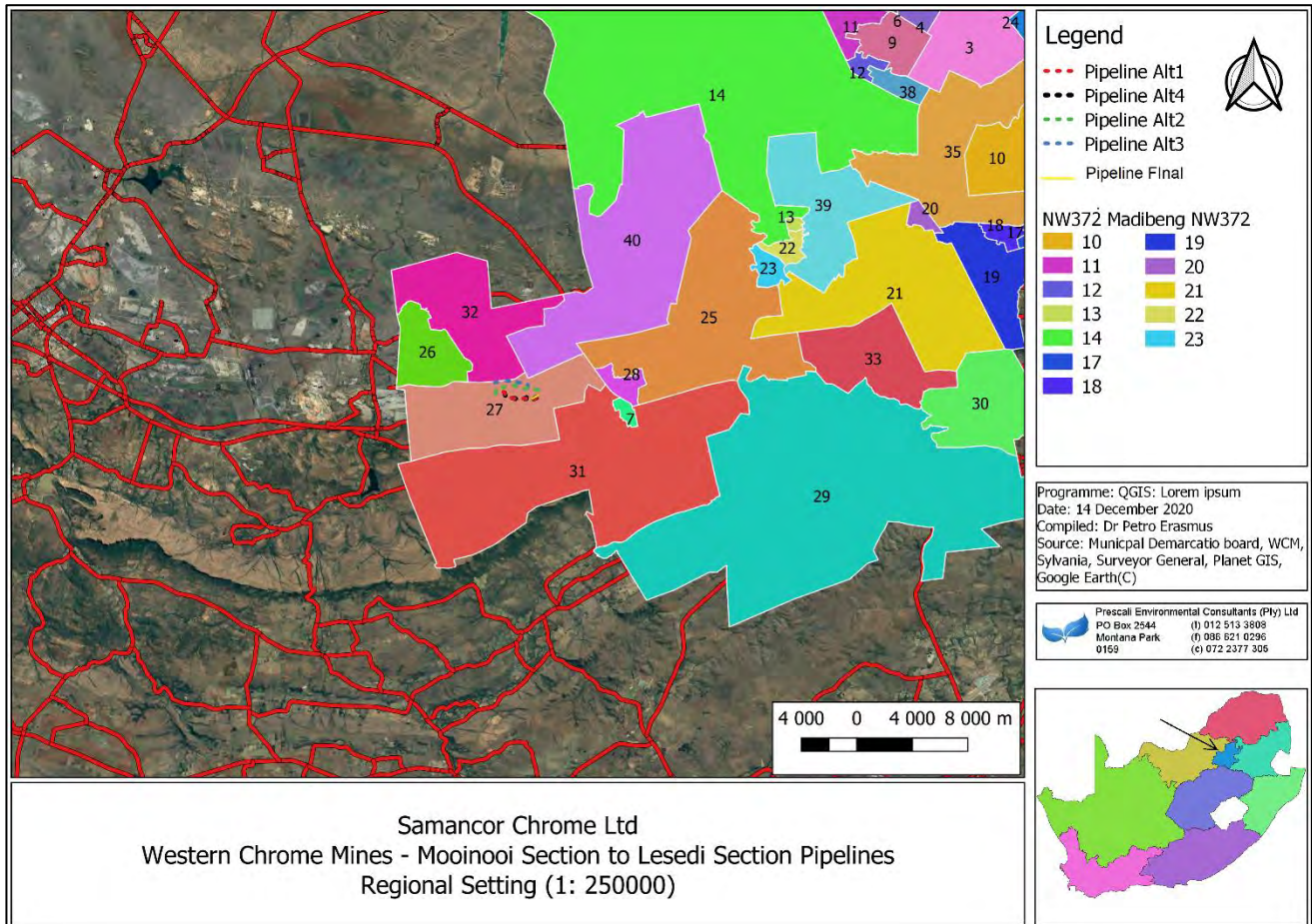


Figure 3-2: Regional Locality Map (1: 250 000)

4 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY.

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) of all the aforesaid main and listed activities, and infrastructure to be placed on site.

Please also refer to Appendix 4.

4.1 Background and Project Justification

Samancor Western Chrome Mine (WCM) has a mining right (DMR Ref No. NW30/5/1/2/2/481 MR and NW30/5/1/2/2/482 MR) for the Mooinooi Section for the underground mining of chrome in terms of the Minerals and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002, as amended). They also have a mining right for Lesedi Section (previously owned by IFMSA) ML88/2003.

The current operational tailings dam at Lesedi has reached capacity and thus it is proposed to pump tailings to the Mooinooi Tailings storage facility. Return water will be pumped back to the Lesedi tailings retreatment operations for re-use. With the expansion of the Mooinooi TSF to include the second compartment it is believed that sufficient space will be available to accommodate the Lesedi tailings.

4.1.1 Business Case

Mooinooi deposits approximately 38 400 tonnes of tailings monthly onto the current TSF at Mooinooi compartment 6W (also known as 6A), while Lesedi currently deposits approximately 19 800 tonnes of tailings monthly onto the Lesedi TSF (averages for July 2019 to June 2020). Potentially up to 31 000 tonnes per month could be generated by the Lesedi plant. The maximum rate for tailings deposition would be for a scenario where the RoM feed to Mooinooi is suspended, with only dump mining, and then at design capacity to fill the PGM plant.



It is estimated that the Mooinooi TSF compartment 6W will contain between 1.9 Million m³ and 2.0 Million m³ when re-mining starts. The planned combined re-mining rate for this dam is 33 150 m³ per month (23 000 t to Mooinooi retreatment plant and 36 000 t to Lesedi retreatment plant at an assumed density of 1.8 t/m³). Using these assumptions, re-mining of the compartment 6W will take approximately 60 months. Once re-mining has been completed, compartment 6W can be prepared again for deposition. Allowing for some flexibility and time to prepare compartment 6W, it is suggested that compartment 6E (also known as 6B) is evaluated for a life of 72 months.

4.1.2 Justification

Without the available space at the Mooinooi Section TSF, the Lesedi tailings retreatment facility will not be able to operate resulting in the loss of employment opportunities.

4.2 Existing Operations

Mooinooi Section is an operating mine and the following infrastructure occur on site (not an exhaustive list):

- Roads;
- Pipelines;
- Electricity lines;
- Beneficiation plant;
- Tailings retreatment plant;
- Waste Rock Dump;
- Backfilled opencast sections;
- Underground mining areas inclusive of adits and vents;
- Tailings storage facility with Return / Storm water dam;
- Water containment facilities;
- Sewage containment facilities;
- Storm water management infrastructures; and
- Offices and Workshops.

Lesedi Section currently is not operating as an underground mine and only tailings retreatment by the appointed contractor is taking place.

4.3 Proposed Infrastructure

Please refer to Appendix 4 and Figure 3-1.

The proposed slurry pipeline and return water pipelines will have a diameter 0.16 m and a throughput capacity 170 m³/h. Boosting stations along the length of the pipeline will be needed and the preferred option is outlined in Part A Sections 8.1.3, 8.1.4 and 8.1.5. A river crossing will be required for the pipelines and vegetation clearance will be needed for a portion of the pipelines.



5 LISTED AND SPECIFIED ACTIVITIES

Table 5-1: Listed Activities

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORIZATION
(E.g. For prospecting – drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route)	Ha or m ²	(Mark with an X where applicable or affected)	GNR LN1: 327 / LN2 325 / LN =3: 324 (07 April 2017)	(Indicate whether an authorization is required in terms of the Waste Management Act). (Mark with an X)
<p><i>“Development of a water and slurry pipeline with a diameter of more than 0.36 m and a throughput capacity greater than 120 l/second”.</i></p> <ul style="list-style-type: none"> • Inside a road reserve; • Outside a road reserve. <p>The diameter of the pipeline will be 160 mm and the throughput capacity will be 170 m³/h.</p>	<p>3.23 km 3 230 m² 1.923 km 0.724 km</p>	N/A	LN1#10	
Vegetation removal for the proposed pipelines inside a road reserve – linear activity.	<p>1.923 km 1 923 m²</p>	X	LN3#12	
Vegetation removal for the proposed pipelines outside a road reserve – Linear activity.	<p>0.724 km 724 m²</p>	X	LN3#12	
<p>Watercourse crossing for the proposed pipelines – footprint less than 100 m² but more than 10 m² in an existing road reserve. This will require a water use licence in terms of Section 21(c) and (i). It is anticipated that more than 10 m³ of material will be moved within the affected watercourse.</p>	40 m ²	<p>X X X</p>	<p>LN3#14 LN1#34 LN1#19</p>	
Phased activities. This includes the vegetation removal, pipeline construction.	0.33 Ha	<p>X X</p>	<p>LN1#67 LN3#26</p>	



6 POLICY AND LEGISLATIVE CONTEXT

(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);

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>The Constitution of the Republic of South Africa (Act No. 108 of 1996) Section 2 of the Constitution of the Republic of South Africa (Act No.108 of 1996) (CA) 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:</p> <ul style="list-style-type: none"> • prevent pollution and ecological degradation; • promote conservation; and • secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. <p>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.</p>	<p>The Draft Basic Assessment Report was accordingly prepared and considered within the constitutional framework set by Section 24 and 33 of the Constitution.</p>
<p>The National Environmental Management Act (Act No. 107 of 1998) and the Environmental Assessment Regulations, 2014 (as amended) The overarching principle of the National Environmental Management Act 1998 (Act No. 107 of 1998) (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.</p> <p>Section 2 of NEMA (Act No. 107 of 1989) provides for National Environmental Management Principles. These principles include</p> <ul style="list-style-type: none"> • 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. • 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. 	<p>The Draft Basic Assessment Report will be distributed for public review for periods stipulated in NEMA as part of the environmental impact assessment process.</p>



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>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.</p> <ul style="list-style-type: none">• 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. <p>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 Minister 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.</p>	
<p>GNR 1147 (20 November 2015) of the National Environmental Management Act, 1988 (Act No. 107 of 1998) - Financial Provisioning Regulations</p> <p>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.</p>	<p>The Final Rehabilitation, Decommissioning and Mine Closure plan for the whole Mooinooi Section was compiled in accordance with GNR 1147.</p>
<p>Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)</p> <p>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 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:</p> <ul style="list-style-type: none">• 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. <p>The aforesaid preamble affirms the general right to an environment provided for in section 24 of the Constitution (as set out hereinabove).</p> <p>The objects of the MPRDA, as set out in section 2 thereof serve as a guide to the interpretation of the Act.</p>	<p>The Draft Basic Assessment Report in compliance Section 38 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).</p>



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>The objects of the MPRDA are as follows:</p> <ul style="list-style-type: none">• 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. <p>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.</p> <p>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.</p> <p>Section 38 of the MPRDA states that the holder of inter alia, a prospecting right, mining right or mining permit:</p> <ul style="list-style-type: none">• 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 –<ul style="list-style-type: none">➢ In accordance with an environmental management plan or approved environmental management programme, where appropriate, and➢ 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	



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<ul style="list-style-type: none">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.	
<p>National Water Act (Act No. 36 of 1998) (NWA) In terms of the NWA, the national government, acting through the Minister of Water and Environmental Affairs (previously the Minister of Water Affairs and Forestry), 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)).</p> <p>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 general authorisation is met). Permissible water use furthermore includes water use authorised by a license issued in terms of the NWA.</p> <p>Section 21 of the NWA indicates that "water use" includes:</p> <ul style="list-style-type: none">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 (section 21(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)); andusing water for recreational purposes (section 21(k)). <p>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</p>	<p>An IWUL has been applied for during the previous authorization. All existing licenced water uses as well as the new Section 21(g) water use needs to be included in the amendment application.</p>



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>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).</p> <p>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.</p>	
<p>National Heritage Resources Act (Act No. 25 of 1999) (NHRA)</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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</p>	<p>An Archaeological Impact Assessment was conducted for the project.</p>



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>burial ground or grave referred to above any excavation equipment or any equipment which assists in the detection or recovery of metals.</p> <p>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:</p> <ul style="list-style-type: none">• 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. <p>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.</p>	
<p>National Environmental Management: Biodiversity Act (Act No. 10 of 2004)</p> <p>The National Environmental Management Biodiversity Act (Act No. 10 of 2004) (NEMBA) aims to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant 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.</p> <p>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".\</p>	<p>The legislation was considered throughout the EIA process and in particular the Ecological Impact Assessment which will comply with the NEMBA.</p>



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>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.</p>	
<p>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA) The National Environmental Management Air Quality Act (Act No.39 of 2004) (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.</p> <p>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.</p>	<p>Currently there are no listed activities that require registration/permitting according to National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004) for the proposed tailings storage facility expansion.</p>
<p>National Environmental Management: Waste Act (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.</p> <p>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.</p> <p>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,</p>	<p>The proposed TSF 6b requires a waste management licence (WML) as listed in GNR 921 of 29 November 2013 (part of a separate application).</p>



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<p>Section 20 of the NEMWA pertains to the consequences of listing waste management activities and states that no person may 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.</p> <p>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.</p>	
<i>Integrated Development Plans</i>	
<p>Madibeng Local Municipality IDP</p> <p>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.</p> <p>The above municipalities are characterised by similar developmental constraints highlighted in the Integrated Development Plans for the respective districts:</p> <ul style="list-style-type: none">• 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 Madibeng 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. <p>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.</p>	<p>The proposed development fall under the jurisdiction of the Madibeng Local Municipality which is located in the Bojanala Platinum District Municipality. The need and desirability of the project is in line with the IDP's of these municipalities.</p>



7 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).

The existing TSF at Lesedi Section is reaching its design capacity thus the need for an area to deposit tailings has been identified. With the proposed expansion to the existing Mooinooi TSF (a separate application) sufficient air space will be available for Lesedi to deposit tailings. Without the needed airspace, basic re-processing of tailings may need to be halted resulting in the loss of employment opportunities.

Lesedi Section has experienced significant shortages of water to such an extent that operations were halted in 2019, the return water from the Mooinooi TSF will alleviate the water shortages to some extent.

There is little doubt that the continuation of the Lesedi tailings retreatment project will generate potentially significant positive economic benefits to both the Provincial and National economies. The potential gains for the local businesses benefiting from the project will be substantial. In addition, the potential secondary economic gains that may flow to the local community in terms of additional revenue for businesses and services may be substantial. An increase in the number of people employed in the local communities' results in an increase in the spending capacity of local people. This facilitates local economic growth.

8 FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVES WITHIN THE 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. All reasonable and feasible alternatives were 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 basic assessment 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.

8.1 Details of the alternatives considered

With reference to the site plan provided and the location of the individual activities on site, provide details of the alternatives considered with respect to the following as discussed.



8.1.1 Property on which or location where it is proposed to undertake the activity

The properties on which the proposed pipelines will be located for the various options are outlined below, see Figure 8-1. The preferred route is Option 4 (Alt4) or Final Route depending on the outcome of the consultation with the property owners.

Pipeline option	Farm	Portion	Owner	Title deed	Share (%) ¹
1,2,3,4, FR ²	Buffelsfontein 465 JQ	12	TC Smelters	T81283/2016	100
1,2,3,4, FR		35	Engela Wilhelmina Christina Welthagen (060305006007)	T20927/1973	N/A
			Lousia Aletta Minnaar (3501120039007)	T21962/1972 & T37606/2002	25 25
			Santambank Ltd	T22474/1985	8.5661
			Anna Elizabetha van Wyk (1409110026004)	T47068/1982	7.8678
			Andries van der Walt (5308095025088)	T6930/2009 & T6932/2009	29.1666 2.0833
			Stephanus Johannes Pretorius (2409095019080)	T30486/1973	6.25
			Andries Stephanus Lourerns van Wyk Trustees	T82953/1994	6.25
			Susara Cornelia Eiendomme cc (CK93/21195/23)	T88922/1994	6.25
			Frans Herman Kuhne (3712035053187)	T6933/2009	N/A
1	Elandskraal 469 JQ	41	Struck Selwyn Charles And 2 Others	T40136/2009	100
2,3		139	Samancor Chrome Ltd	T28352/1999	100
3		87	Samancor Chrome Ltd	T10083/1993	100
3		86	Samancor Chrome Ltd	T10083/1993	100
3		88	Samancor Chrome Ltd	T10083/1993	100
2,3		1	Samancor Chrome Ltd	T10083/1993	100
2,3		152	Samancor Chrome Ltd	T76333/2001	100
3		153	Samancor Chrome Ltd	T76333/2001	100
1,4, FR		154	Samancor Chrome Ltd	T76333/2001	100
1,4, FR		155	Kuhne Trust	T61278/2019	100
1,4, FR	156	Fourie Marjorie Frances	T123143/2000	100	
1,4, FR	157	PSG Haulers Cc	T56758/2018	100	
1,4, FR	159	Vastek Trading Pty Ltd	T72225/2015	100	
1,4, FR	160	B Vaster B Prop Pty Ltd	T1495/2010	100	
1,4, FR	161	Republiek Van Suid Africa	T21382/1982	100	
2,3	2	Pretorius Willem Abraham Jacobus	T10657/1956	100	

¹ Note: the total share value as indicated in the information provided by Surveyor General is greater than 100%

² FR: Final Route option

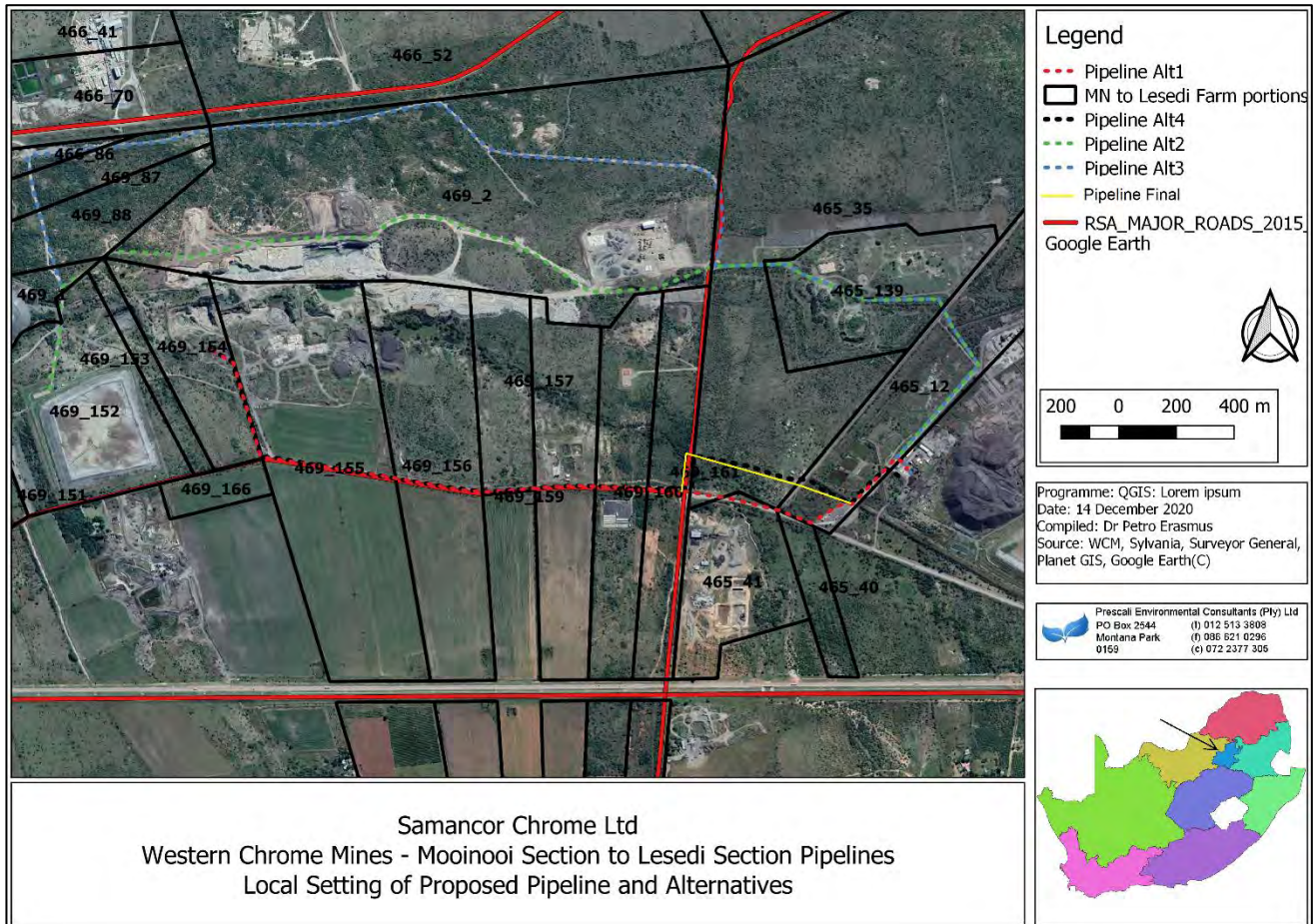


Figure 8-1: Alternative Options for the proposed tailings and water pipeline

8.1.2 Type of activity to be undertaken

The proposed pipeline is the preferred alternative for conveying the tailings from Lesedi Section to the Mooinooi Section TSF and the return water from Mooinooi TSF to the Lesedi Tailings retreatment plant. An alternative would be to truck the tailings to the Mooinooi TSF and the return water back to Lesedi but this would increase traffic on the district road and is not preferred.

8.1.3 Design or layout of the activity

Various layout options were investigated and the preferred option is either Option Alt4 (Upstream of single carriageway culvert) or Pipeline final (downstream of Culvert) as the impact on the watercourse will be less than Option Alt1 (only 1 watercourse crossing and smaller footprint area inside the regulated 100 m buffer area). Option Alt2 and Alt3 is not preferred due to the greater length and the fact that potential impacts as a result of theft and vandalism will be greater. **Negotiations with the affected property owners is underway and will be the deciding factor for which of Option Alt4 or Pipeline Final (as per Figure 8-1) will be implemented.**

8.1.4 Technology to be used in the activity

Pumping with positive displacement pumps, to eliminate the use of booster stations, was evaluated, but option discarded due to high capital cost of equipment and operating complexity.

The pumping system was design by Patterson and Cook and the reports are provided in Appendix 6.6 and Appendix 6.7.

- A gland seal water (GSW) system will supply water to the proposed two tailings multistage centrifugal pumps (one standby 10-PU-201 and one duty 10-PU-211). The duty GSW pump supplies GSW through a common manifold to eight duty tailings pumps. The standby GSW pump is dedicated for the standby tailings pump train (i.e. each GSW pump supplies a dedicated tailings pump train). Provision is made



switch-over valve arrangement to allow the duty GSW pump to service the standby tailings pump train and vice versa. Water is fed to the GSW buffer tank 10-TK-201 through an automated butterfly valve (UV-01-101).

- A level transmitter LIT-10-101 monitors the tank level and is used as control input to the automated butterfly valve position set point to control the tank level. Two suction headers provide water to the duty and standby GSW pumps that service tailings pump train A and B, respectively. An isolation valve is provided on each suction header. The valves in both suction headers must have the ability to be locked in an open position, to prevent unauthorized closure. Pressure relief valves are installed on each GSW pump suction to protect the GSW pump and downstream equipment against system overpressure.
- Pressure indicators are provided on the suction of each GSW pump to monitor the pump suction pressure. Pressure transmitters are installed on each discharge header of the GSW pump to allow for control and real-time monitoring of the discharge pressures. The GSW pump speed will vary to keep the GSW pump discharge pressure above the tailings pump station discharge pressure.
- A flow meter in each GSW line will monitor the GSW flow rate to each tailings pump gland. The flow rate reading will assist pump set up during commissioning. The flow meter is used to monitor the system for a low flow alarm and a low-low flow alarm. The low alarm will allow the tailings pipeline system to continue to run and only show an alarm on the SCADA. A low alarm may indicate poor GSW pump performance, or some water discharged through the relief valve. A low-low alarm will initiate an emergency shut down of the operating tailings pump train. A low-low alarm may be caused by a tripped GSW pump, high GSW discharge through the relief valve or a closed isolation valve in the GSW pump suction line.
- The return water system will operate intermittently and is equipped with standby and duty FSD pumps.
 - The duty pump is started or stopped manually based on the return water dam (RWD) level.
 - Pressure indicators are installed on the suction (PI-01-301, -302) and discharge (PI-01-311, -312) of the standby and duty pump for pump performance diagnostics and system pressure monitoring.
 - The flow rate of the return water system is measured by a common flow meter (FIT-01-301) for monitoring purpose. A pressure relief valve is installed on each pump suction to protect the pump from overpressure.

8.1.5 Operational aspects of the activity.

The option of using the “Phoenix” TSF area as authorised as outlined below were investigated. Unfortunately, every attempt in the past 2 years to start with site establishment has resulted in great financial loss to Sylvania as a result of theft of cables, fences and other infrastructure. This site is thus at this point in time not a suitable area for disposal and development. In addition to the foregoing, this site is uneconomical at the current value of material processed at Lesedi: the capital required to develop the site is very high due to unsuitable founding conditions and the operating cost is very high due to distance from the operations. Environmental Authorisation: NWP/EIA/44/2012 (28/03/2013) and Water use licence: 03/A21J/ACGI/3262 Dated 2015/07/16 as amended and signed 12/11/2020).

With regards to the pipeline the following is noteworthy as per the Patterson and Cook reports provided in Appendix 6.6 and Appendix 6.7:

- Tailings pipeline:
 - Though HDPE piping was preferred, the high pressure near the pump stations required a mix of HDPE and steel pipes.
 - Centrifugal slurry pumps will be used, these are all V-belt and pulley driven and fitted with fixed speed drives.
 - Pneumatically operated knife gate valves are selected for the tailings suction piping to isolate the pumps from the tailings tank. Hydraulically actuated pinch valves are selected for the pump train discharge piping to alternate between the duty and standby pump and isolate the pumps from the pipeline.



- Pressure gauges are used to monitor the pump train suction pressure and pressure transmitters for the discharge pressures. The tailings flow rate and density are monitored using a slurry magnetic flow meters and a nucleonic densitometer, respectively.
- The tailings pumps are specified with restricted glands and the GSW distribution system must be capable of supplying water for eight tailings pumps operating at a rate of 2.4 m³/h per pump. The tailings pumping system has a maximum discharge pressure of 3895 kPa. The GSW pump must deliver 21 m³/h and at a pressure of 4324 kPa to account for fittings losses between the pump and the tailings pump glands.
- Return water pipeline:
 - The return water flow rate is specified to match the water content of the tailings disposed at the TSF (including added gland seal water). The return water is transferred at 174 m³/h.
 - HDPE pipes with an outside diameter of 280 mm will be used.
 - Centrifugal dewatering pumps will be used and are V-belt and pulley driven and fitted with fixed speed drives.
 - Manually operated knife gate valves are selected to isolate the return water pumps for maintenance. Non-return valves are installed to avoid reverse flow between the duty and standby pumps.
 - Pressure gauges are installed on the pump suction and discharge to monitor pressure. A magnetic flow meter is installed on the overland pipeline to monitor the return water flow rate back to the plant.

8.1.6 Option of not implementing the activity.

As indicated, the existing residue deposit site at Lesedi Section is nearing the design capacity and without the proposed disposal at Mooinooi Section the Lesedi Tailings retreatment plant will need to be put under care and maintenance and this will result in the loss of existing employment positions and revenue.

9 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.

This section of the report provides an overview of the tasks undertaken for the Public Participation Process (PPP) to date. The PPP was conducted in terms of Chapter 6 of the NEMA and included the following:

- Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties);
- Placement of site notices on farms, and other accessible public areas;
- Formal notification of the application to key Interested and Affected Parties and other stakeholders;
- Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments. This appendix will be included in the Final Basic Assessment; and
- Newspaper adverts.

The objectives of PPP include:

- Provides Interested and Affected parties (I&APs) with an opportunity to voice their support, concerns and raise questions regarding the project, application or decision;
- Provides an opportunity for I&APs, Environmental Assessment Practitioners (EAPs) and the Competent Authority (CA) to obtain clear, accurate and understandable information about the environmental, social and economic impacts of the proposed activity or implications of a decision;
- Provides I&APs with the opportunity of suggesting ways of reducing or mitigating negative impacts of an activity and for enhancing positive impacts; and
- Enables the applicant to incorporate the needs, preferences and values of affected parties into the application.



The PPP must comply with the several important sets of legislation that require public participation as part of an application for authorisation or approval; namely:

- The Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

Adherence to the requirements of the above-mentioned Acts will allow for an Integrated PPP to be conducted, and in so doing, satisfy the requirement for public participation referenced in the Acts. During the process, the following methods are used to develop a stakeholder database which will be utilised to ensure a proper representation of stakeholders interested in or affected by the proposed Project.

This included the following:

- Search works and desktop searches are conducted in and around the project area to verify land ownership and obtain contact details;
- Responses received from newspaper advertisements, public notices and site notices;
- Responses received from distribution of the Background Information Document (BID);
- Identification and consultation with stakeholders including commenting authorities (local and district municipalities);
- Organs of state, other than the competent authority, such as the Department of Agriculture, Forestry and Fisheries (DAFF) having jurisdiction in respect of any aspect of the proposed project and affected authorities; and
- Consultations with affected landowners.

The PPP commenced on 06 August 2020 with a site visit which included the placing site notices in and around the fences of the affected farms. The notification procedure is included in Appendix 5.

The following notification methods were used:

- Site Notices: erected at prominent points on 06 August 2020
- Newspaper advertisement: published in the Britspos on 07 August 2020 and the Rustenburg Herald on 07 August 2020; and
- Background Information Document: Distributed via email in August 2020 and January 2021.
- Hand delivered notices in February 2021.



9.1 Summary of issues raised by I&APs

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

This section will be updated in the final report that will be submitted to the DMRE as the PPP is still on-going.

Results of consultation at the time of printing of this report is outlined in the Table below.

Table 9-1: Summary of issues raised by I &APs

Interested and Affected Parties	Date Received	Comments	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status
<i>List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.</i>					<i>(consensus, dispute, not finalised, etc.)</i>
Landowner/s	X				
Landowners has been notified using email, post and hand delivered notices. As yet no written feedback has been received. During telecommunications with some of the property owners the following was raised:					
Mr Andre van Wyk (representing portion 35 Buffelsfontein 365 JQ)	X	Telephone conversation 15 February 2021	The Pipeline needs to be buried on portion 35: A servitude needs to be applied for.	Due to maintenance of the pipeline it is preferred that the pipes be located above surface. A servitude will be applied for, it is anticipated that the servitude will be 15 m wide and that if possible it will be fenced.	Not finalised
Mr Sarel Minnaar (representing portion 35 Buffelsfontein 365 JQ)	X	Verbal discussion: 5 February 2021	A Servitude needs to be registered; Property owners need to be compensated for the servitude area.	A servitude will be applied for, it is anticipated that the servitude will be 15 m wide and that if possible it will be fenced. An agreement will be put in place.	Not finalised
Mr Solly Ncoane (Department of Public Works, Portion 161 Elandskraal 469 JQ)	X	email: 09 February 2021	Kindly send your application the Department for consideration and processing	Information and background information with an application was submitted.	Not finalised
Lawful occupier/s of the land					
Only 1 registration was received in response to the site notice, newspaper advertisement and hand delivered notices. No comments received to date.					
Landowners or lawful occupiers on adjacent properties					
Only 1 registration was received in response to the site notice, newspaper advertisement and hand delivered notices. No comments received to date.					



Interested and Affected Parties	Date Received	Comments	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status
Municipal councillor					
Cllr Ellen Dikgang	X	Background information notice was emailed. A meeting will be arranged during the time this report is available for comment.			
Municipality					
Background information notice was emailed but was returned undelivered. Hard copies of the draft BAR will be submitted to Infrastructure (Roads) and to Environmental survives at Madibeng Local Municipality. A copy will also be delivered to the Bojanala District Municipality.					
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc.					
Background information notice was emailed but was returned undelivered. Hard copies of the draft BAR will be submitted to the Department of Roads in Rustenburg.					
Communities					
Only 1 registration was received in response to the site notice, newspaper advertisement and hand delivered notices. No comments received to date.					
Dept. Land Affairs					
Background information notice was emailed. Hard copies of the draft BAR will be submitted to the Department.					
Traditional Leaders					
A meeting will be arranged with the Tribal authority.					
Dept. Environmental Affairs					
Background information notice was emailed. Hard copies of the draft BAR will be submitted to the Department.					
Other Competent Authorities affected					
Background information notice was emailed. Hard copies of the draft BAR will be submitted to the Department of Water and Sanitation.					
OTHER AFFECTED PARTIES					
Only 1 registration was received in response to the site notice, newspaper advertisement and hand delivered notices. No comments received to date.					
INTERESTED PARTIES					
Only 1 registration was received in response to the site notice, newspaper advertisement and hand delivered notices. No comments received to date.					



10 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE ALTERNATIVES.

(The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

10.1 Climate

Located between the towns of Rustenburg and Brits, Mooinooi's section climate is, using the Köppen-Geiger climate classification, classified as BSh (Hot semi-arid climates) (Climate, 2020). The average annual temperature in Brits is 18.7 °C (Meteoblue, 2020), on average January is the hottest month (23.4 °C) and June the coldest (11.7 °C).

Information sourced from Meteoblue 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 predominant wind direction is East-North-East, Figure 10-2.

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 10-1. From the graph it can be seen that January/December is the hottest months at 32 °C and June / July is the coldest months at 4 °C.

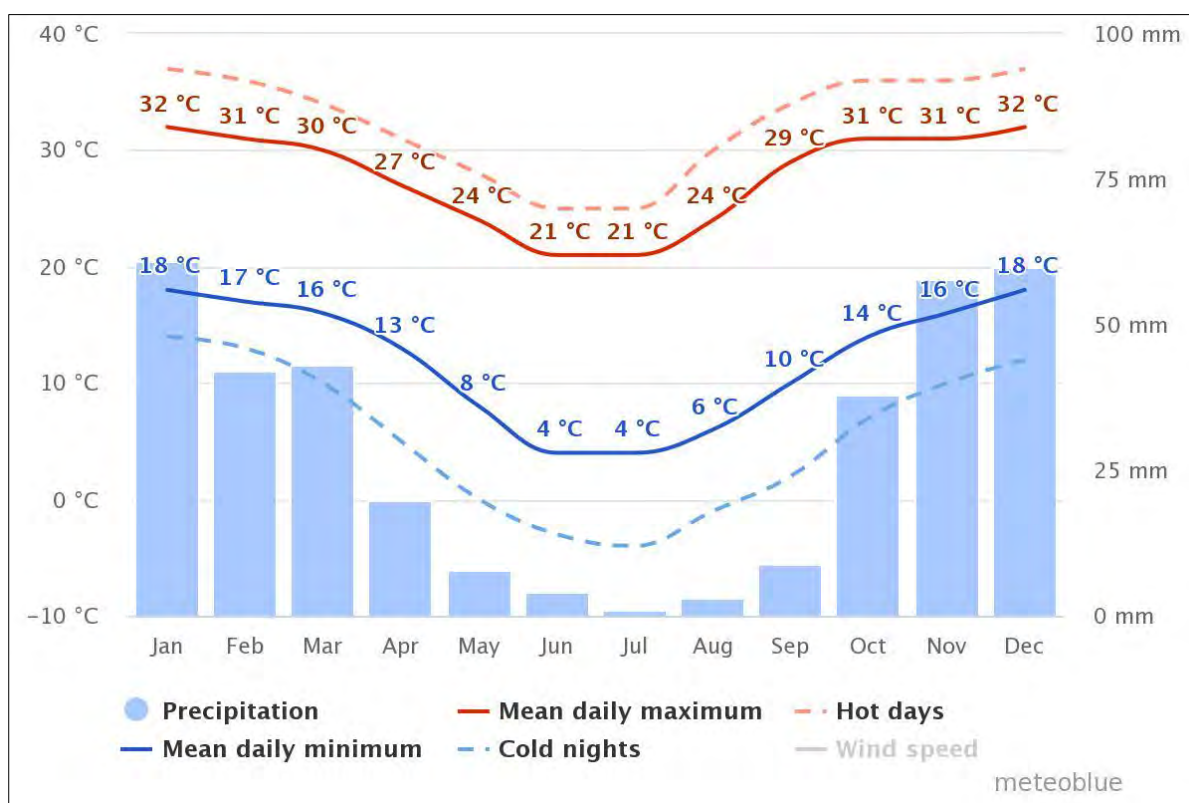


Figure 10-1: Brits Monthly Temperatures, Precipitation and Wind speed

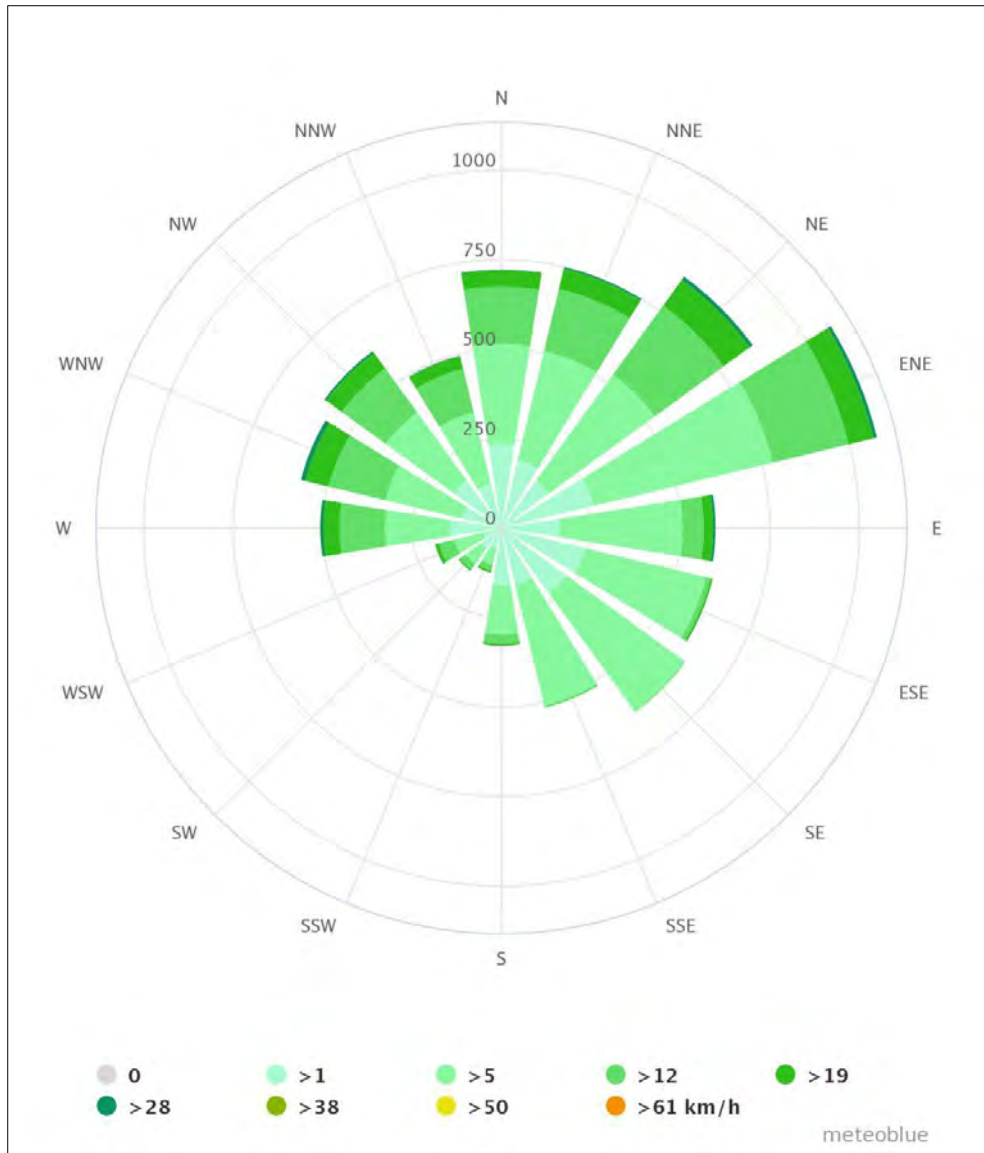


Figure 10-2: Brits Wind rose- (source: Meteoblue)

10.1.1 Precipitation

From the information from Climate-Data.org (Climate, 2020) the average rainfall figures for Brits are provided in Table 10-1. July / August are the driest months (5 mm) of rain and January the wettest (110 mm) on average. Mean Annual Precipitation for the Mooinooi to Lesedi sections is indicated in Figure 10-3 and is ~642 mm per year.

Table 10-1: Mean Climatic rainfall conditions for the project area

Month	Average Monthly Rainfall (mm)
January	110
February	88
March	68
April	47
May	19
June	7
July	5
August	5
September	14
October	55
November	97
December	105

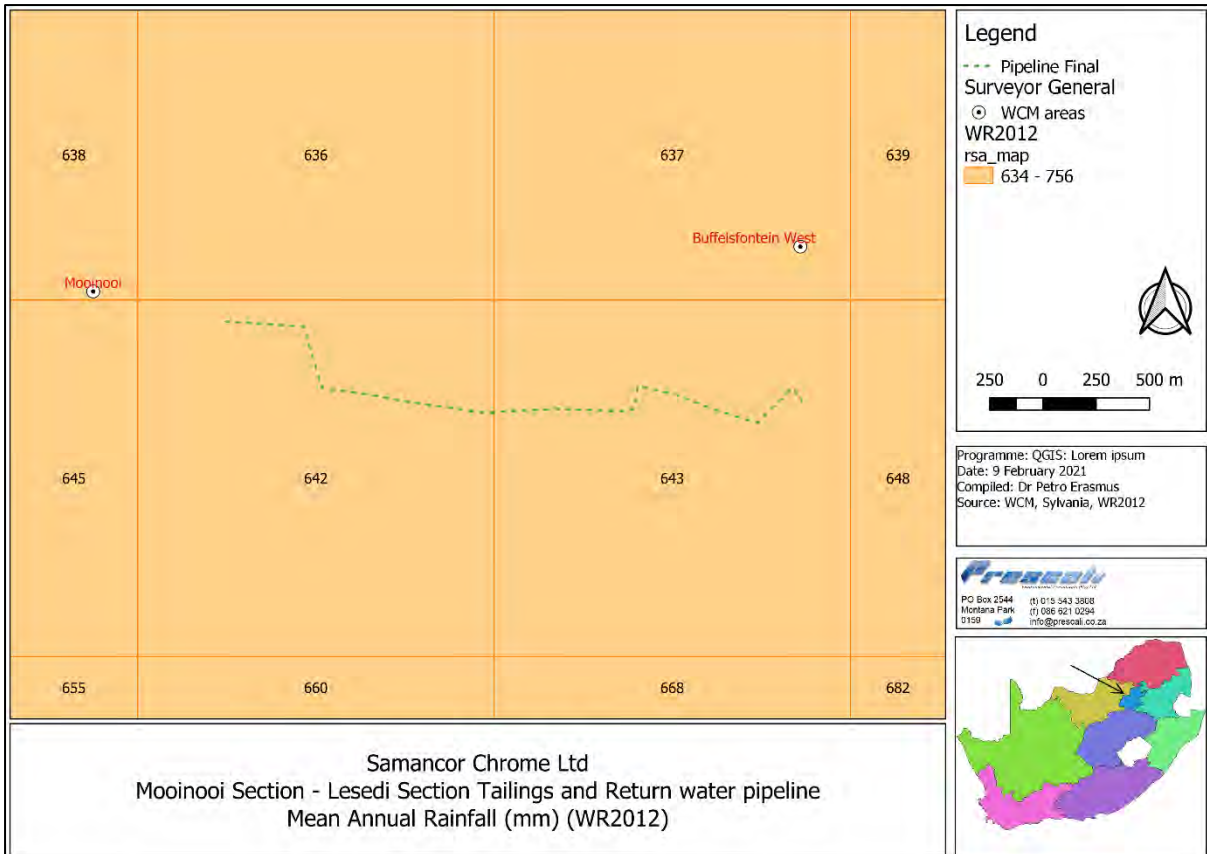


Figure 10-3: Mean annual precipitation (mm)

With regard to evaporation, the proposed pipelines will be situated within 2 200 - 2 600 mm A-pan evaporation zone, Figure 10-4.

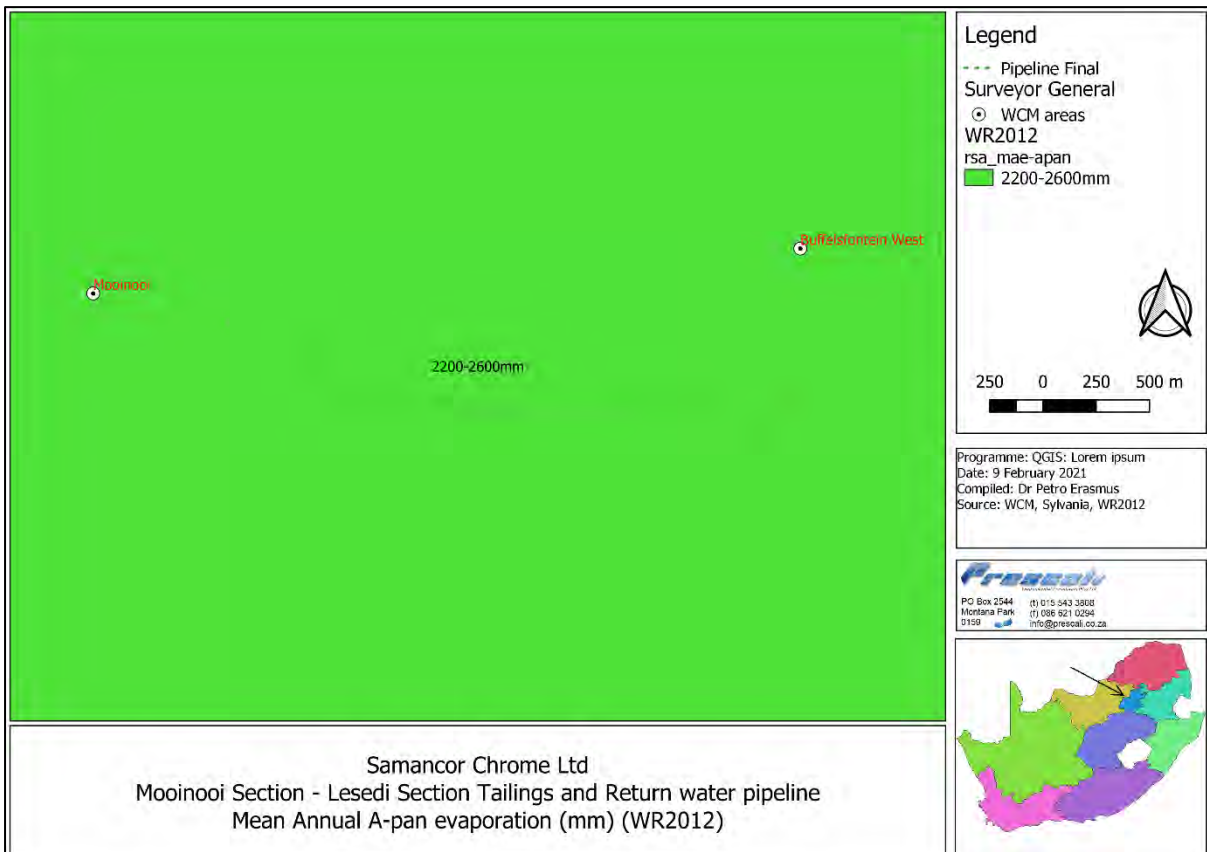


Figure 10-4: Mean Annual A-Pan Evaporation (mm) (WR2012)



10.2 Topography

The area is situated on the northern slopes of the Magaliesberg and adjacent low-lying areas to the north, is very effectively sheltered by the extensive Highveld plateau and the Magaliesberg Mountain. The proposed pipeline lies on a flat topography between the 1 160 m.a.s.l and 1 200 m.a.s.l elevation. The surrounding area is also flat with excavations and tailings altering the topography.

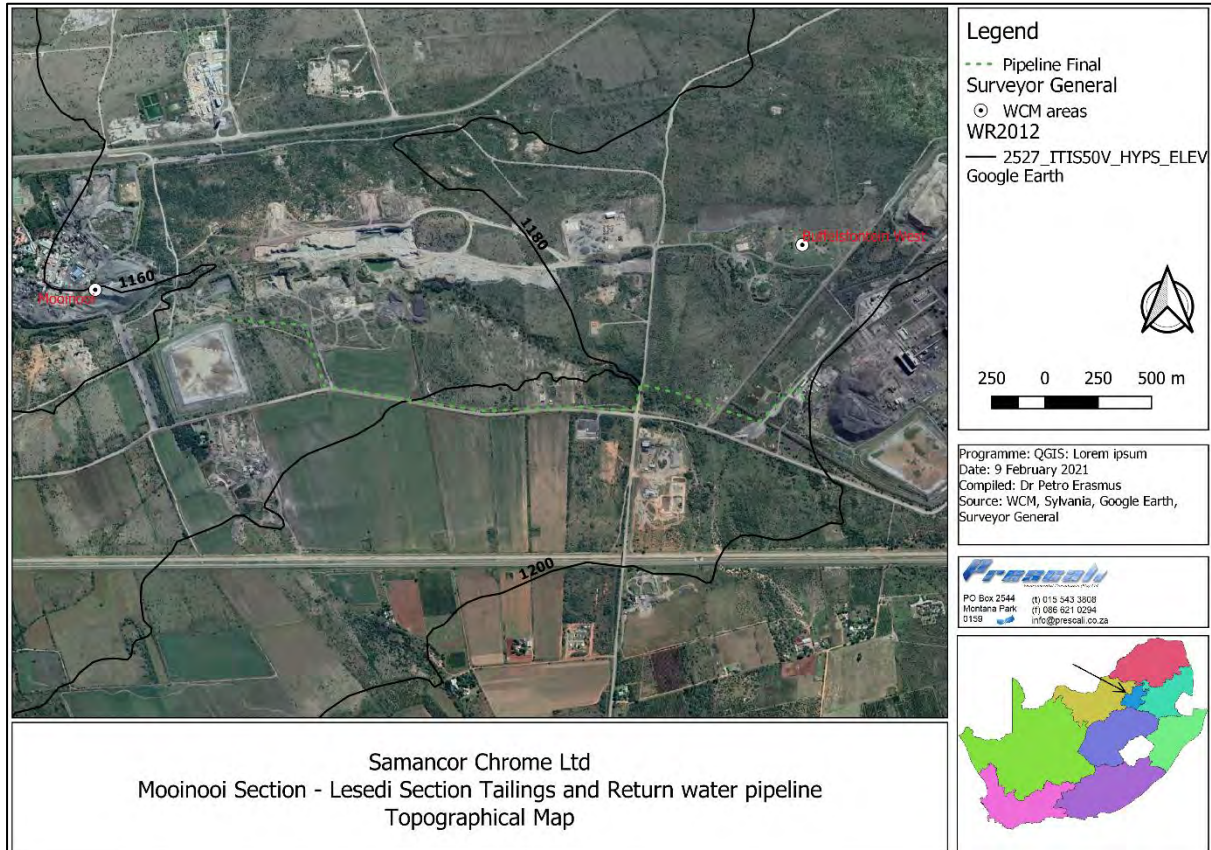


Figure 10-5: Map showing topography of the Mooinooi – Lesedi Pipeline area

10.3 Geology

10.3.1 Regional Geology

The Bushveld Igneous Complex contains the chromite ore resources in South Africa. This complex is a saucer-like intrusive igneous mass extending for about 400 km from east to west and roughly the same distance north to south (Figure 10-6). This geological phenomenon consists of a series of interconnected ultramafic-mafic layered intrusions and a suite of associated granitoid rocks. The ultramafic-mafic layered rocks occur in three main limbs, namely the western, eastern and northern limbs. Four areas in which chromite ore is mined within the Bushveld Igneous Complex are the eastern chromite belt, the western chromite belt, the Zeerust district and the area south of Potgietersrus. The WCM Mooinooi to Lesedi Sections site is situated within the western limb of the Bushveld Igneous Complex (Figure 10-6). From the information sources from WR2012, the pipelines will be located on Schilpadnest Subsuite of Rustenburg Layered Suite of Bushveld Complex (Figure 10-7).

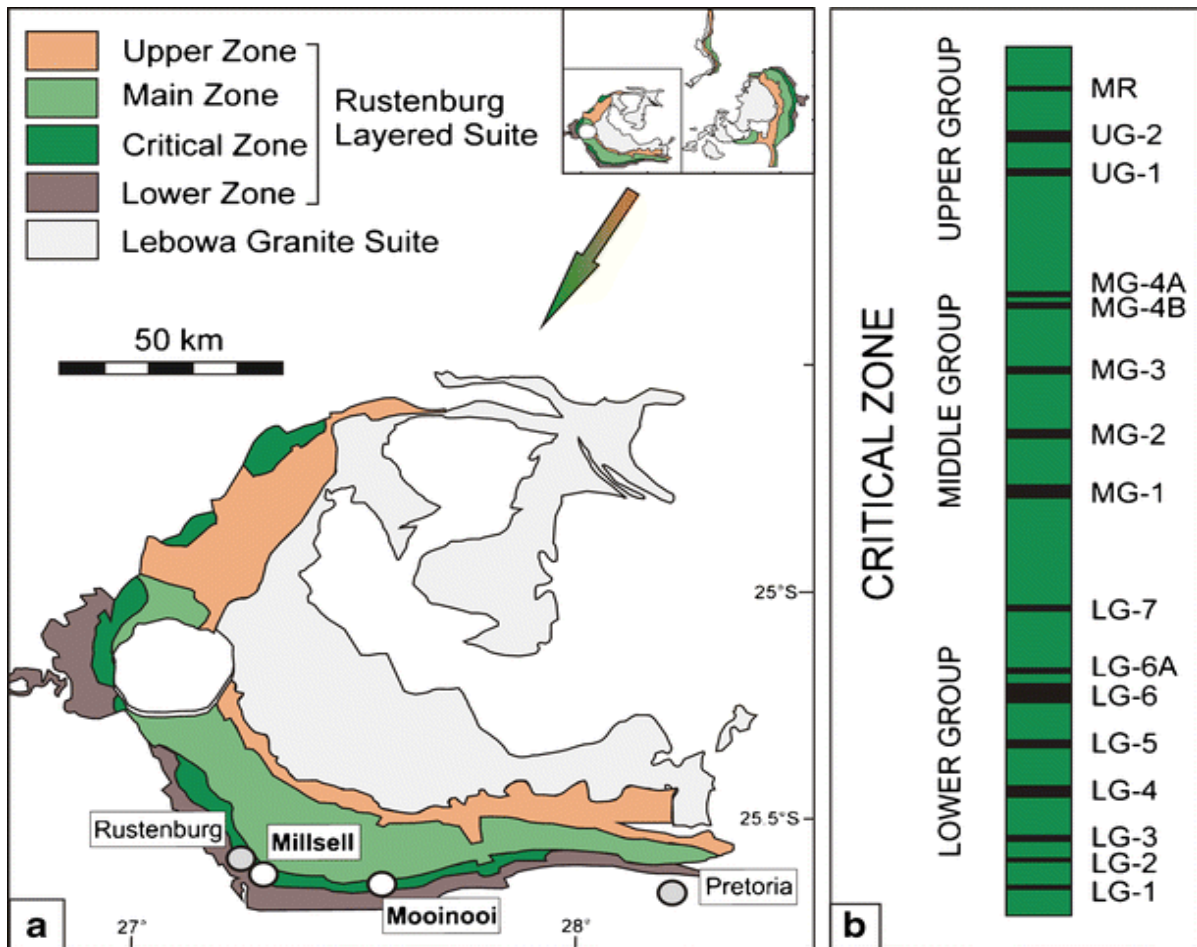


Figure 10-6: Geological Map of the Western Limb of the Bushveld Complex

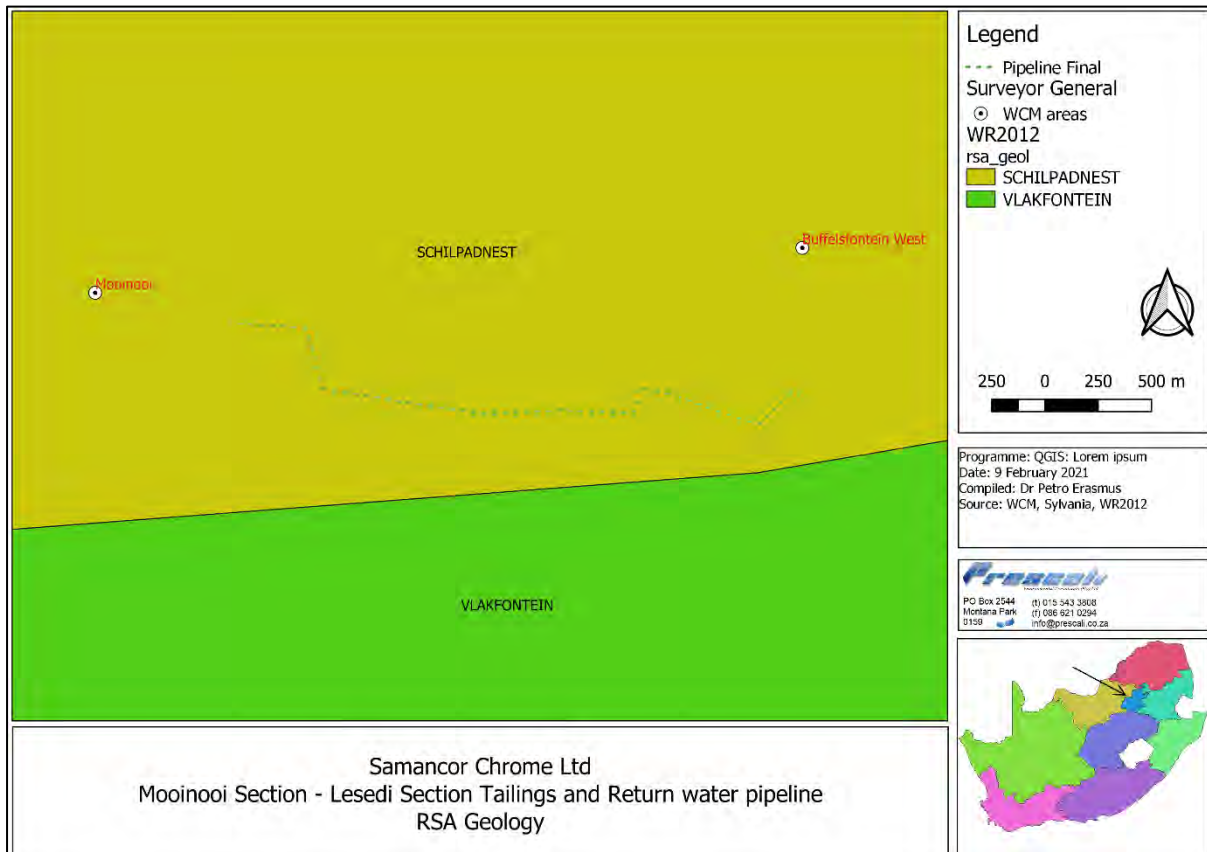


Figure 10-7: Regional geological sub-suite



10.4 Surface Water

10.4.1 Affected River Basin- Upper Crocodile catchment

The Mooinooi and Lesedi Sections is situated in the Limpopo Water Management Area (WMA) which incorporates the Crocodile – West (Marico) catchment, specifically the A21K quaternary catchment (Mooinooi Section and the Lesedi Tailings retreatment plant) of the Upper Crocodile catchment (Figure 10-8)

Economic activity in the Upper Crocodile catchment is highly diverse and ranges from mining and metallurgic industries to irrigation, dry land and subsistence agriculture and dense residential areas. The Upper Crocodile is the second most populous water management area in the country and has the largest proportionate contribution to the national economy (DWAf, 2004).

Due to a high-water demand in the area, water is imported from other catchment into the Upper Crocodile catchment.

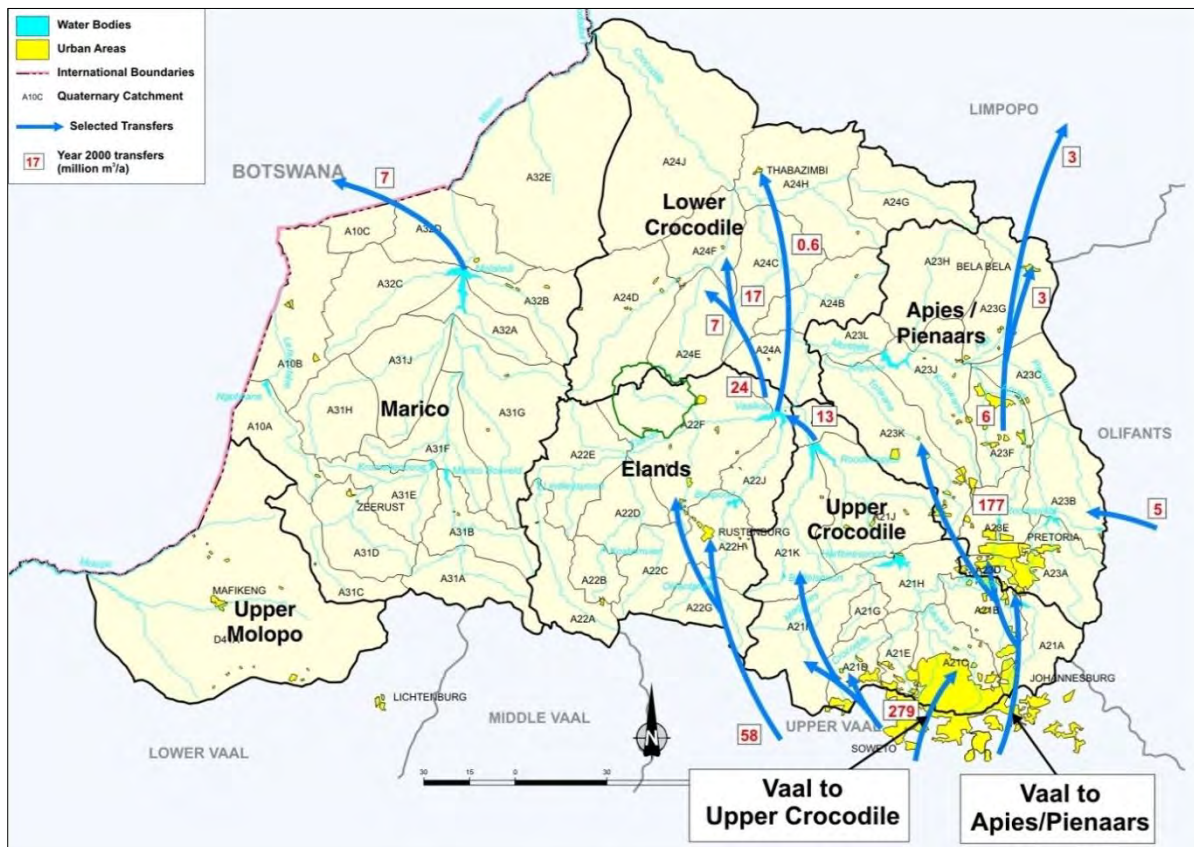


Figure 10-8: Base Map of the Crocodile- (West) Marico water management area and its sub-areas (DWAf, 2004)

10.4.2 Quaternary Catchments

The proposed pipelines are located within the A21K Quaternary catchment (Figure 10-9) of the Upper Crocodile catchment area of the Crocodile River Catchment. The Mean Annual Evaporation, Mean Annual precipitation and MAR is indicated in Table 10-3. The area is mainly traversed by the Buffelsfonteinspruit and the Maretswana River.

The Buffelsfonteinspruit flows in from the east and merge with the Maretswana River at Mooinooi Section. The Maretswana River flows north where it meets the Sterkstroom River, which eventually flows into the Crocodile River. The Maretswana River drains to the north-west into the Middelkraal Dam (Figure 10-9).

The proposed pipeline will cross the non-perennial, i.e. seasonal Buffelsfonteinspruit.



Table 10-2: Reconciliation of water requirements and availability for the Upper Crocodile sub-management area Year 2000 (million m³/a) (DWAf 2004)

Natural Resource		Usable return flow			Total local yield	Transfers	Grand Total
Surface water	Ground water	Irrigation	Urban	Mining and Bulk			
111	31	21	158	15	336	279	615
1. After allowance for the impacts on yield of: ecological component of reserve, River losses, alien vegetation, rain-fed agriculture and urban runoff							
Local Requirement			Transfers		Balance		
556			17		42		

Available water			Water requirements			Balance
Local yield (1)	Transfers in	Total	Local requirements (2)	Transfers out	Total	
399	382	781	673	13	686	95
1. Based on existing infrastructure and under construction in the year 2000. Also includes return flows resulting from growth in requirements						
2. Based on normal growth in water requirements as a result of population growth and general economic development. Assumed no general increase in irrigation						
3. Brackets around numbers indicate negative balance						

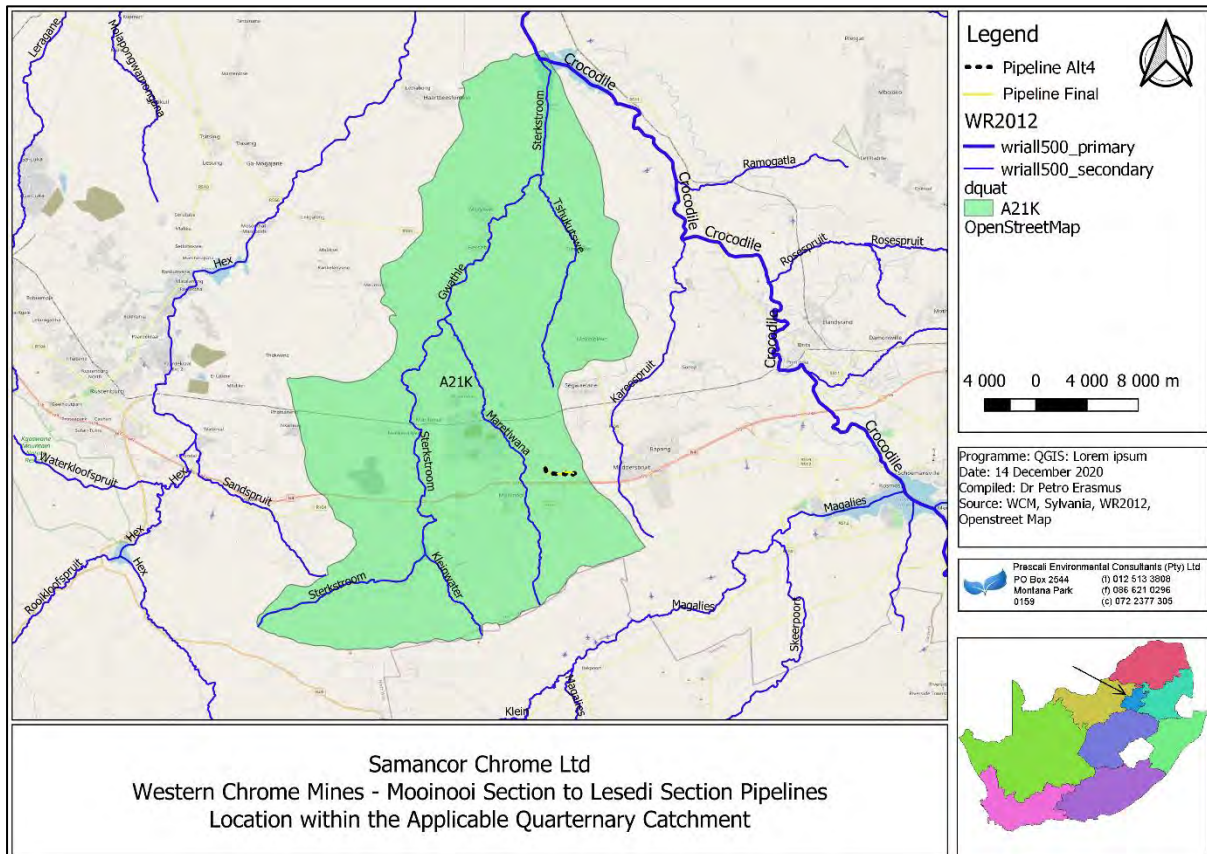


Figure 10-9: Location of the proposed pipelines within A21K

Table 10-3: Applicable catchment areas MAR, MAP and MAE information (Baily & Pitman, 2015)

Area	Catchment Area		MEA (mm) (S-pan)	MAP (mm)	MAR (million m ³ /a)
	Nett (km ²)	Gross (km ²)			
Crocodile (West) Marico	43 235	41 208	1 833	591	670
Upper Crocodile	6 336	6 176	1 709	667	185.6
A21K	865	865	1 744	651	2373



10.4.3 Site Specific water resources

A surface water assessment was conducted by Prescali Environmental Consultants in August 2020 which dealt with site specific water resource information. Findings of the assessment will be discussed in details in sections below (also refer to Appendix 6).

The Buffelsfonteinspruit (originating on Portion 146 of the Farm Buffelsfontein 465 JQ in the Magaliesberg protected environment) merge with an unnamed tributary originating on Portion 145 of the Farm Buffelsfontein 465 JQ before flowing through several portions of the Farm Groenkloof 464 JQ.

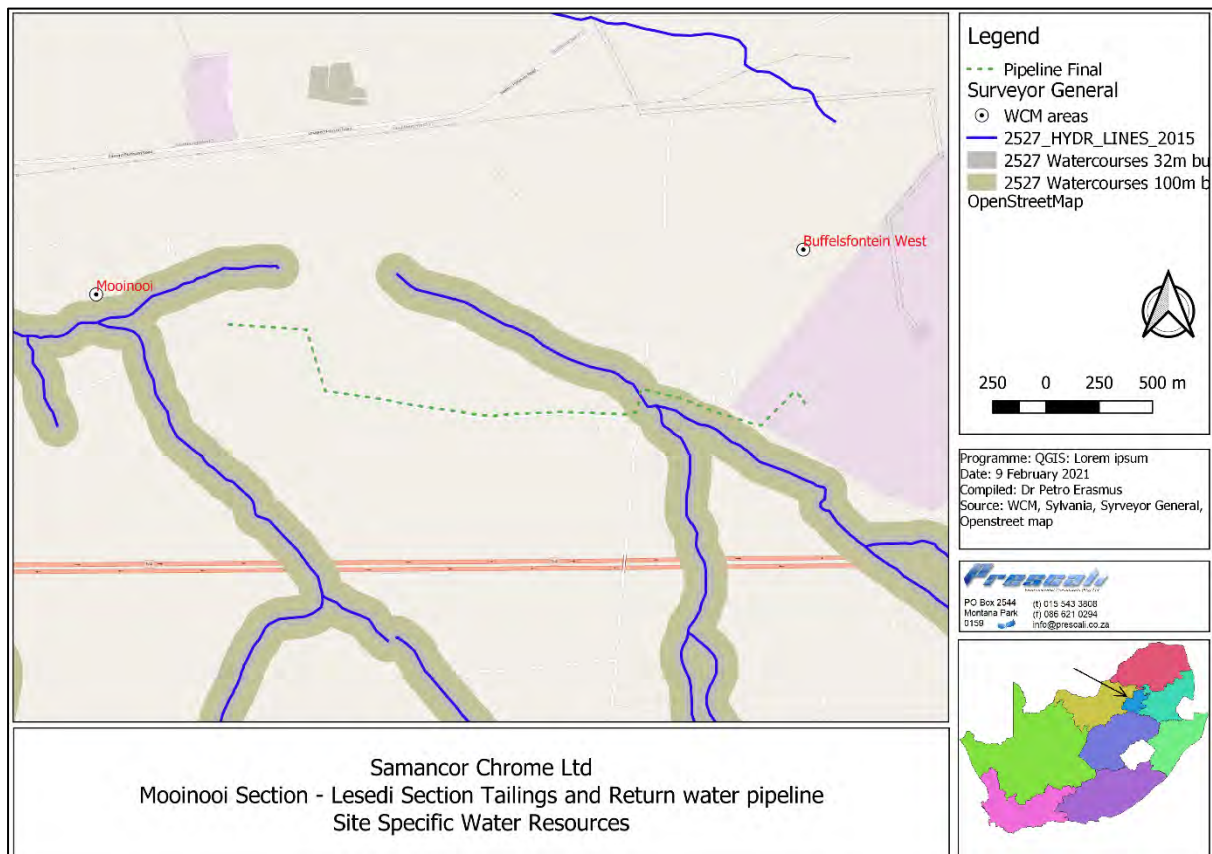


Figure 10-10: Site Specific water resources

10.4.4 Surface water quality

Samancor has been monitoring the Maretswana River on a monthly basis and data from April 2019 till May 2020 was made available and is represented in Table 10-4. Two of the monitoring sites were used: MN07 which is located upstream and MN09 which is located downstream of the confluence with the Buffelsfonteinspruit.

From the available quality data, it can be seen that the water quality in the Maretswana River is generally of good quality and with the exception of Nitrate (MN09 and UT), is suitable for domestic use based on the parameters indicated. The only parameter that exceeded the TWQR for aquatic use is Electrical Conductivity if it is assumed that MN07 represent a normal environment. 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, Total Dissolved Solids).



Table 10-4: Average surface water quality in the Maretlwana River

Parameter		MN07	MN09	SANS 1:2015	241- Aquatic (DWAF, 1996)	Domestic (DWAF, 1996)	Agriculture	
							Livestock (DWAF, 1996)	Irrigation (DWAF, 1996)
Alkalinity	mg CaCO ₃ /l	68.625	92.242	N/A	N/A	N/A	N/A	N/A
Calcium	mg Ca/l	12.518	25.054	N/A	N/A	< 32	< 1000	N/A
Chloride	mg/l	20.465	36.203	≤300 (AS)	N/A	100	<1500 Monogastrics and poultry; <3000 other livestock	<1
Electrical conductivity	mS/m	24.195	46.464 ³	≤170 (AS)	15% normal from	< 70	156 (Dairy Pigs and Poultry), 313 Cattle & Horses, 469 (Sheep)	6.25
Magnesium	mg/l	11.146	17.885	N/A	N/A	< 30	< 500	N/A
Nitrate	mg/l	1.799	10.363	≤11 (AH)	N/A	< 6 NO ₃	< 100 NO ₃ ;	N/A
pH	pH units	8.0	8.1	≤5.0 to ≤9.7 (OP)	5% normal from	6 - 9	N/A	6.5 - 8.4
Potassium	mg/l	3.899	5.263	N/A	N/A	< 50	N/A	N/A
Sodium	mg/l	20.278	34.943	≤200 (AS)	N/A	< 100	< 2000	< 70
Sulphate	mg/l	22.989	52.238	≤500 (AH); ≤250 (AS)	N/A	< 200	< 1000	N/A
Total Dissolved Solids	mg/l	142.471	280.599	≤ 1 200 (AS)	Guideline	< 450	< 1000 Dairy, pigs and Poultry; < 2000 Cattle and horses; < 3000 Sheep	<40

³ 192% increase from MN07

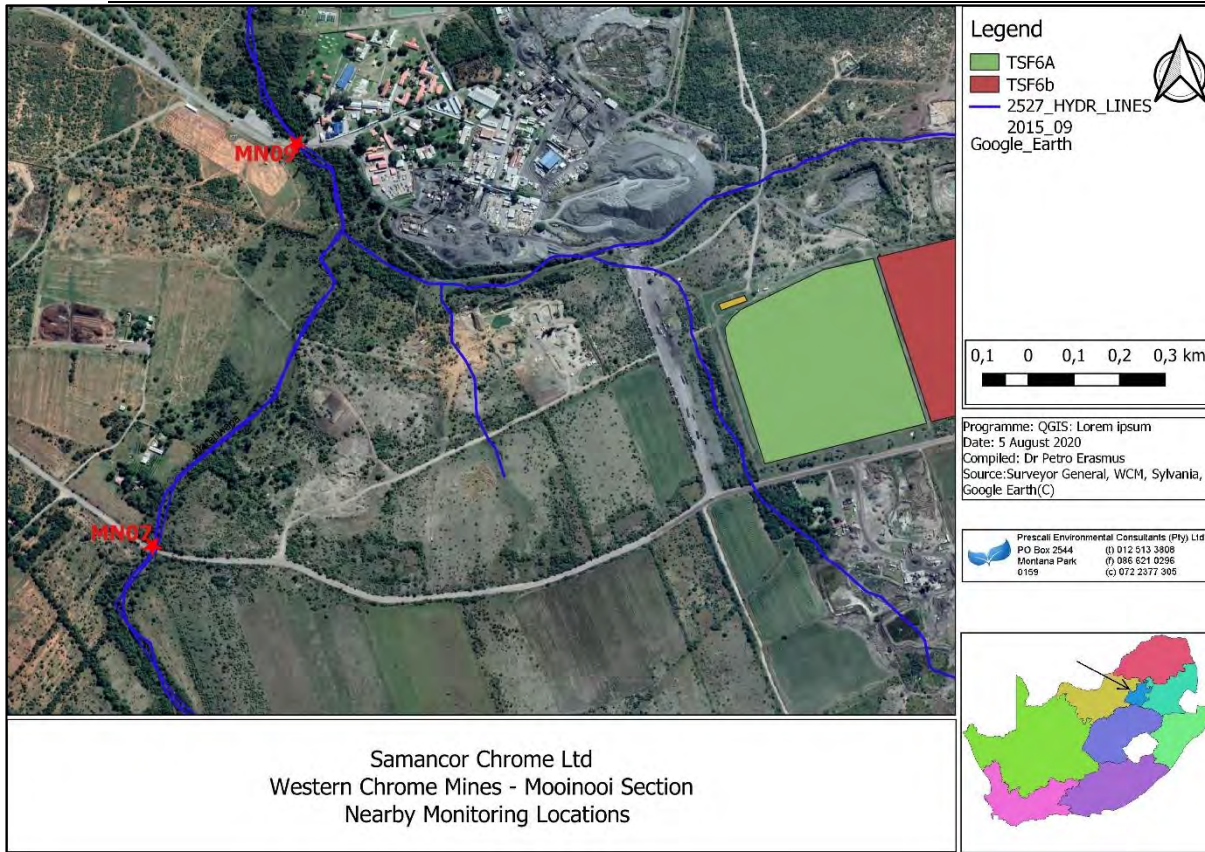


Figure 10-11: Location of monthly surface water monitoring locations

10.4.5 Sensitive Areas

The Pipelines development site was assessed using the Department of Environmental Affairs screening tool (Figure 10-12) and supporting desktop assessment and during the site visit and a summary is provided in Table 10-5.

Table 10-5: Results of the Screening Tool Assessment for Aquatic Biodiversity

Site	Desktop & Screening tool	Site visit
Pipeline	Very High FEPA Code 2 – Fish support area Aquatic CBA	Low for all areas outside of the 1 in 100 floodline, 100 m legislated buffer and 32 m sensitivity buffer. Medium for all areas within the 100 m legislated buffer area. High for all areas within the 32 m sensitivity buffer. Very high for the in 100 year floodline.

The Buffesfonteinspruit is impacted upstream of the propose pipelines river crossing by anthropogenic impacts upstream (bridge, diversion) and downstream (bridge, historic opencast sections), refer to Appendix 6.

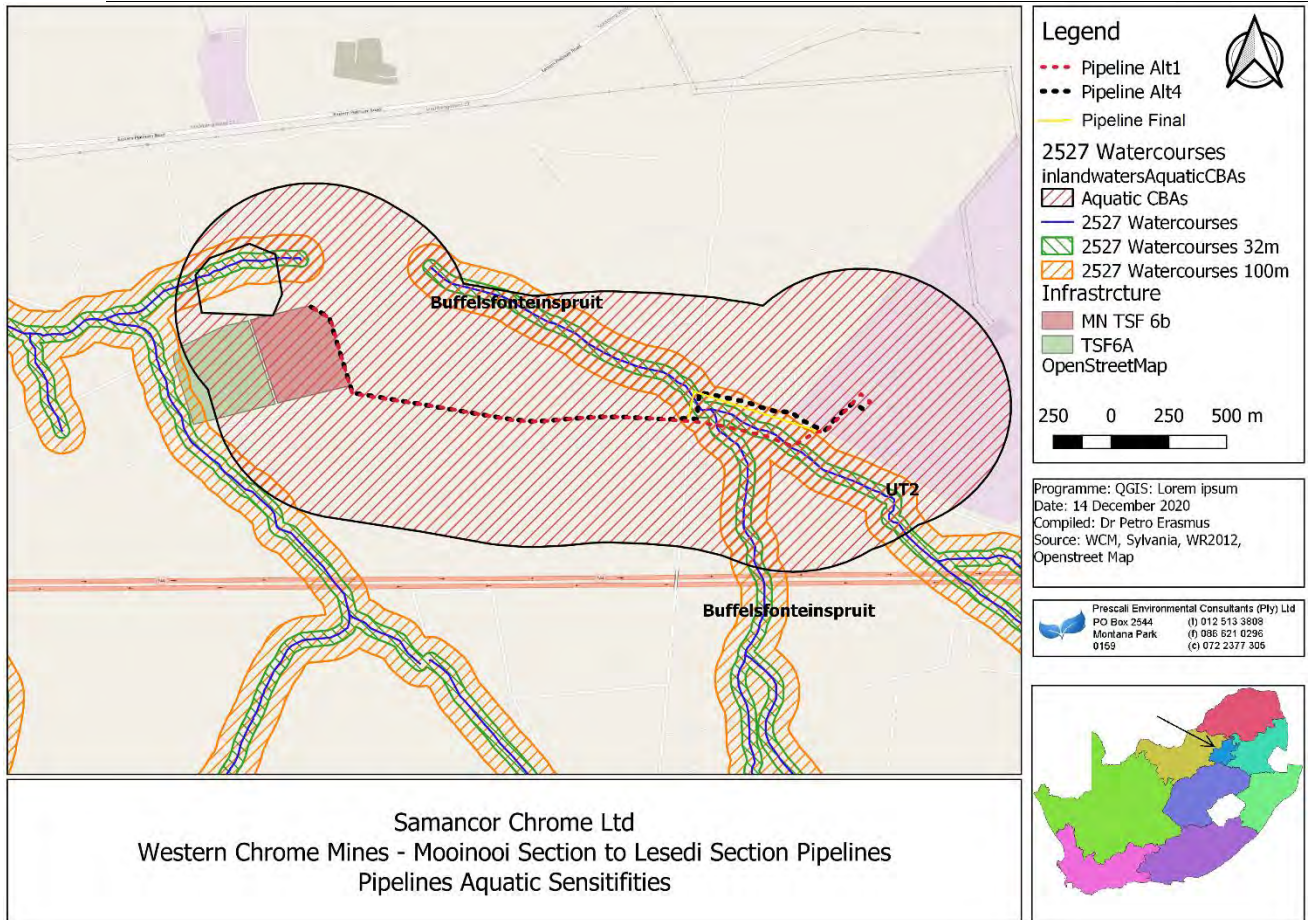


Figure 10-12: Aquatic Sensitivity as per the screening tool

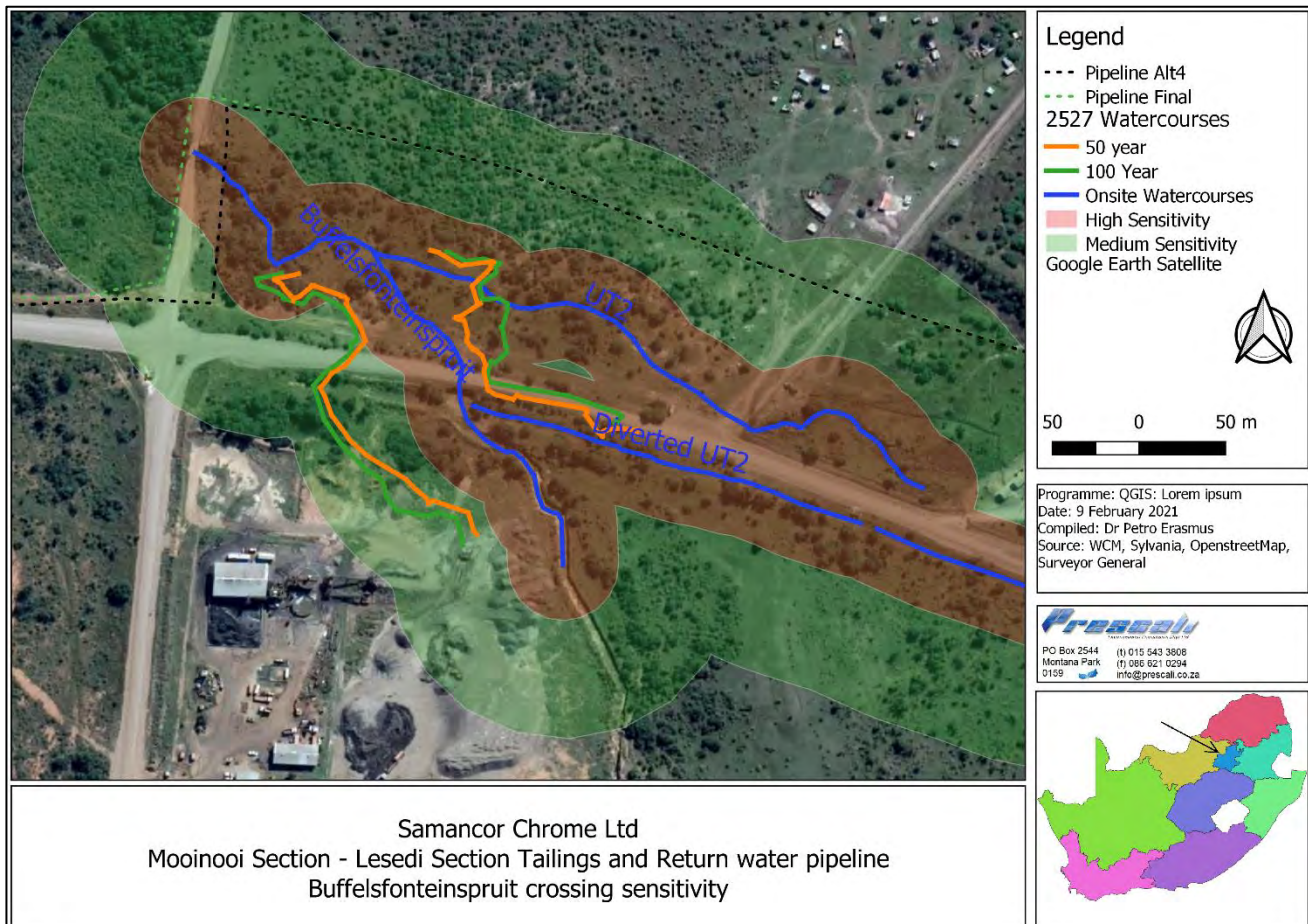


Figure 10-13: Proposed watercourse crossing aquatic sensitivity



10.5 Groundwater

Information below was sourced from the geo-hydrological impact assessment by GPT Global in August 2020.

10.5.1 Regional hydrological setting

According to the 1:500 000 hydrogeological map (Johannesburg 2526) the Mooinooi Section is located on a fractured and intergranular aquifer, with a successful borehole yield of between 0.5 l/s and 2.0 l/s.

According to Barnard (2000) as cited by GPT, the rocks of the Rustenburg layered suite are characterized by a well-developed igneous layering. The mainly mafic rocks include norite, gabbro, magnetite gabbro anorthosite and pyroxenite. Groundwater occurrence is associated mainly with deeply weathered and fractured mafic rocks. Some of the norite zones weather more easily than other rock types. This characteristic in association with north-south striking dykes that cut through and across the norite, has formed groundwater compartments especially in the area between Rustenburg and Pretoria. The groundwater yield potential is classified as poor as the majority of the boreholes on record produce less than 2 l/s. The mafic rocks weather to a clay rich soil that is represented by the well-known black turf. The very low permeability of this soil (in the order of 10^{-3} m/d) is considered to reduce recharge to underlying aquifers. The depth to groundwater rest level is between 5 and 40 m below surface.

10.5.2 Water Levels

During the hydrocensus, sixteen (16) boreholes were visited and eleven (11) boreholes were available for groundwater level measurement. The remaining boreholes were equipped (had no access in measuring the water levels). It was recorded that these boreholes were mainly used for domestic purpose.

The groundwater levels varied between a minimum of 8.71 m and a maximum of 25.40 m below ground level (Table 10-6). The average depth to water level is 14.22 m. The relationship between surface topography and groundwater level elevation, is shown in Figure 10-15 below.

Usually a good relationship should hold between topography and static groundwater level. This relationship can be used to distinguish between boreholes with water levels at rest, and boreholes with anomalous groundwater levels due to disturbances such as pumping or local hydrogeological heterogeneities. This general relationship shows a good correlation with a regression value (R_2) of 0.92.

However, due to the heterogeneity of the subsurface, these relationships should not be expected to hold everywhere under all circumstances, and deviations could thus be expected.

Table 10-6: Available groundwater level statistics

Groundwater level statistics	
Number of boreholes	11
Number of boreholes with anomalous water level	1
Minimum water level	8.71
Maximum water level	25.40
Mean water level	14.22

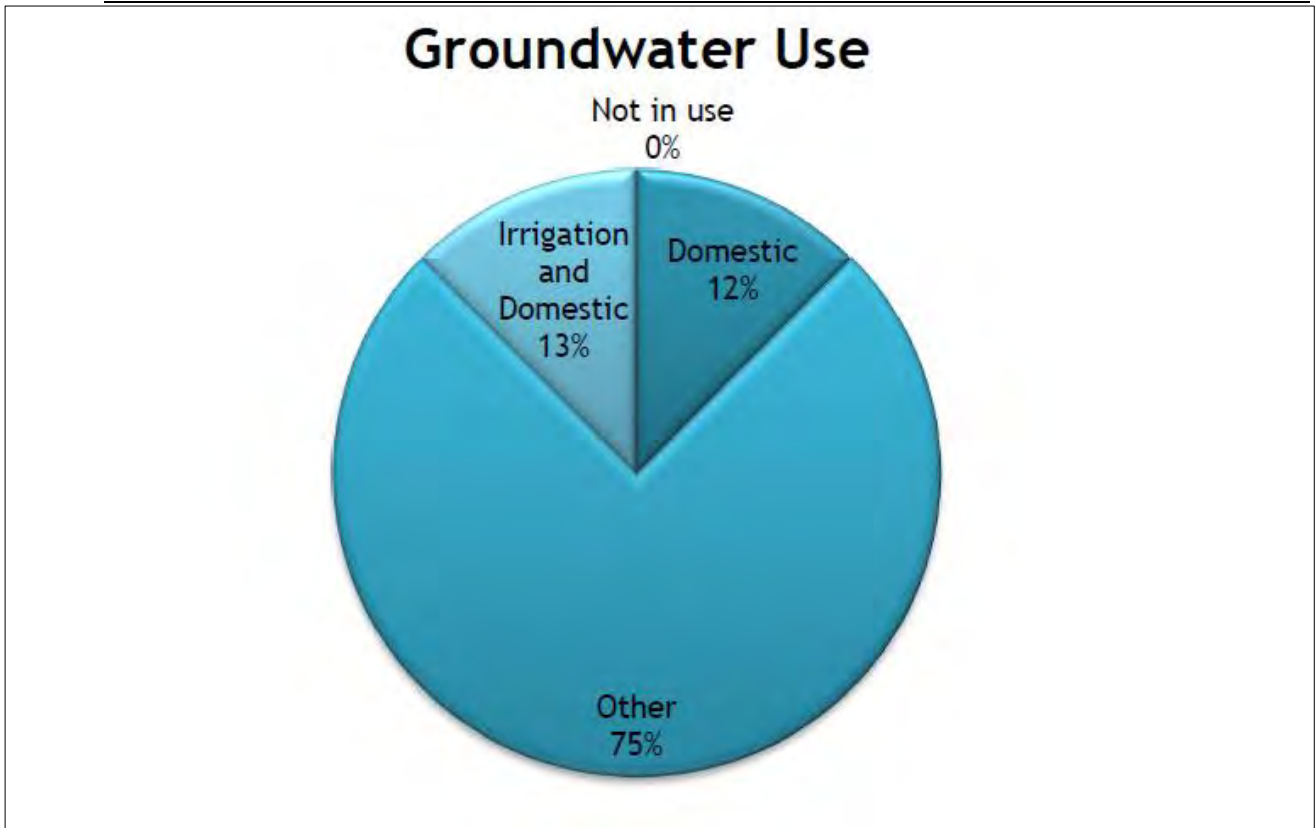


Figure 10-14: Groundwater use

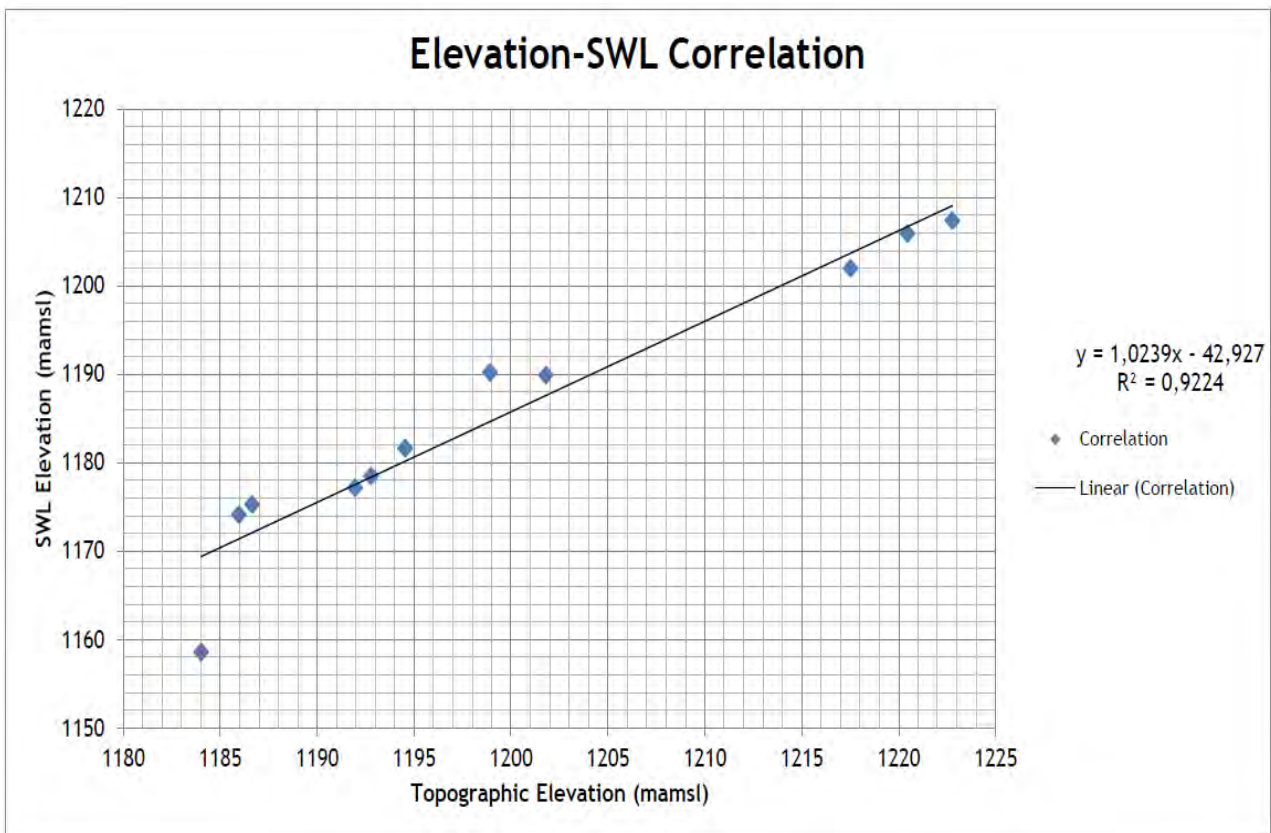


Figure 10-15: Correlation Graph of topography vs available water levels

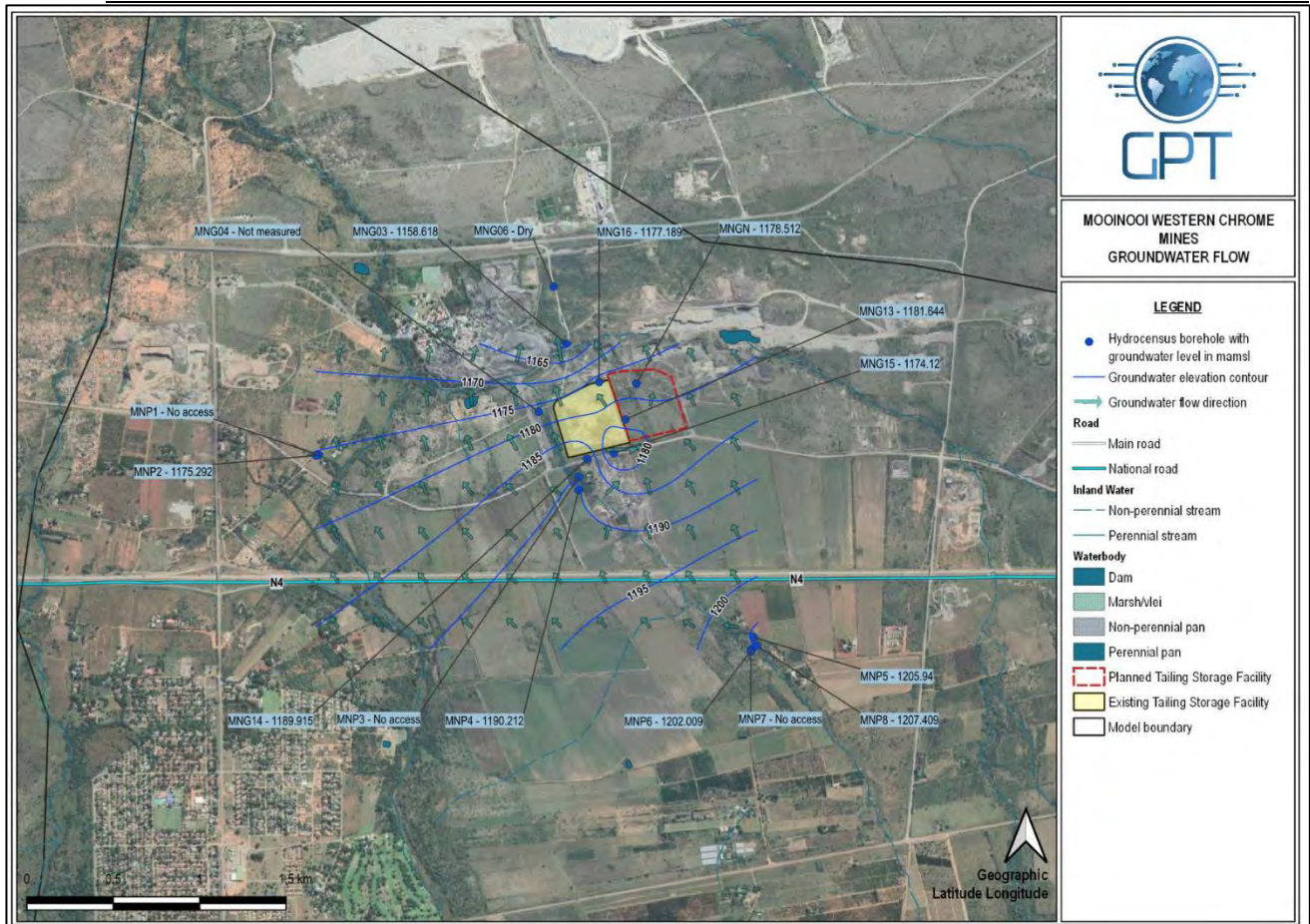


Figure 10-16: Hydrocensus Borehole positions and water levels

10.5.3 Water Quality

The water quality results for four (4) of the monitoring boreholes were compared with the maximum recommended concentrations for domestic use as defined by the SANS 241-1: 2015 target water quality limits. The SANS 241-1: 2015 standard is applicable to all water services institutions and sets numerical limits for specific determinants to provide the minimum assurance necessary that the drinking water is deemed to present an acceptable health risk for lifetime consumption. Colours of individual cells refer to the drinking water classification of the specific groundwater sample (Table 10-7).

From this comparison, the following is evident:

- TDS exceeds the allowable limit in samples MNG02, MNG10, MNG11, MNG12;
- Nitrate as N exceeds the allowable limit in samples MNG02, MNG03, MNG11, MNG12;
- Nitrite as N exceeds the allowable limit in samples MNG02, MNG03;
- Chloride exceeds the allowable limit in samples MNG02;
- Sodium exceeds the allowable limit in samples MNG02;
- Total manganese exceeds the allowable limit in samples, MNG03, MNG07, MNG09, MNG10, MNG13; and
- Nickel exceeds the allowable limit in sample MNG03.



Table 10-7: Chemical results monitoring boreholes compared to the SANS 241:2015 2nd edition standards

Parameter	Unit	SANS 241: 215 Recommended Limits	Risk	Results										
				MNG02	MNG03	MNG04	MNG07	MNG09	MNG10	MNG11	MNG12	MNG13	MNG16	
Physical & Aesthetic Determinants														
Electrical conductivity at 25C	EC	mS/m	≤ 170	Aesthetic	291.2	203.1	93.9	59.3	184.9	208.3	174.2	184.4	98.6	87.6
Total Dissolved Solids	TDS	mg/liter	≤ 1200	Aesthetic	2078.5	1173.8	695.843	331.483	1108.7	1237.8	1203.1	1223.04	593.573	537.7993
pH at 25C		pH units	≥ 5 to ≤9.7	Aesthetic	7.318	7.985	7.552	7.471	7.131	8.392	7.45	7.472	8.355	8.648
Chemical Determinants - Macro Determinants														
Nitrate as N	NO ₃	mg/liter	≤ 11	Acute Health	41.683	12.552	7.969	-0.459	0.948	-0.459	41.161	31.834	2.608	5.138
Nitrite as N	NO ₂	mg/liter	≤ 0.9	Acute Health	8.321	1.527	-0.069	0.148	0.152	-0.069	-0.069	0.078	0.116	-0.069
Combined Nitrate & Nitrite		mg/liter	≤ 1	Acute Health	50.004	14.079	7.9	-0.311	1.1	-0.528	41.092	31.912	2.724	5.069
Sulphate	SO ₄	mg/liter	Acute Health ≤500; Aesthetic ≤250	Acute Health/Aesthetic	442.67	147.46	99.389	6.217	86.859	90.504	243.98	295.503	5.916	150.2
Fluoride	F	µg/liter	≤1500	Chronic Health	-466	724	-466	-466	-466	-466	-466	-466	-466	-466
Chloride	Cl	mg/liter	≤ 300	Aesthetic	429.31	34.622	50.284	39.862	201.39	216.92	133.12	180.125	70.341	49.944
Sodium	Na	mg/liter	≤ 200	Aesthetic	213.61	43.504	22.7371	17.6519	129.79	194.49	133.95	59.3	32.267	16.751
Zinc	Zn	µg/liter	≤5000	Aesthetic	0	0	0	0	0	0	0	0	0	0
Copper	Cu	µg/liter	≤ 2000	Chronic Health	-5	23	15.2573	16.4311	-5	-5	-5	-5	-5	-5
Total Iron	Fe	mg/liter	Acute Health ≤ 2; Aesthetic ≤0.3	Acute/Aesthetic	-0.009	0.021	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
Total manganese	Mn	mg/liter	Acute Health ≤0.4; Aesthetic ≤0.1	Acute/Aesthetic	0.068	0.23	-0.001	0.12168	0.309	0.106	0.036	0.042	0.313	0.001
Nickel	Ni	µg/liter	≤ 70	Chronic Health	-5	152	-5	-5	-5	-5	-5	-5	-5	-5
Aluminium	Al	µg/liter	≤ 300	Operational	7	5	-5	-5	-5	-5	5	32	-5	-5
Chemical Determinants - Organic Determinants														
Concentration deemed to present an unacceptable health risk for lifetime consumption.														

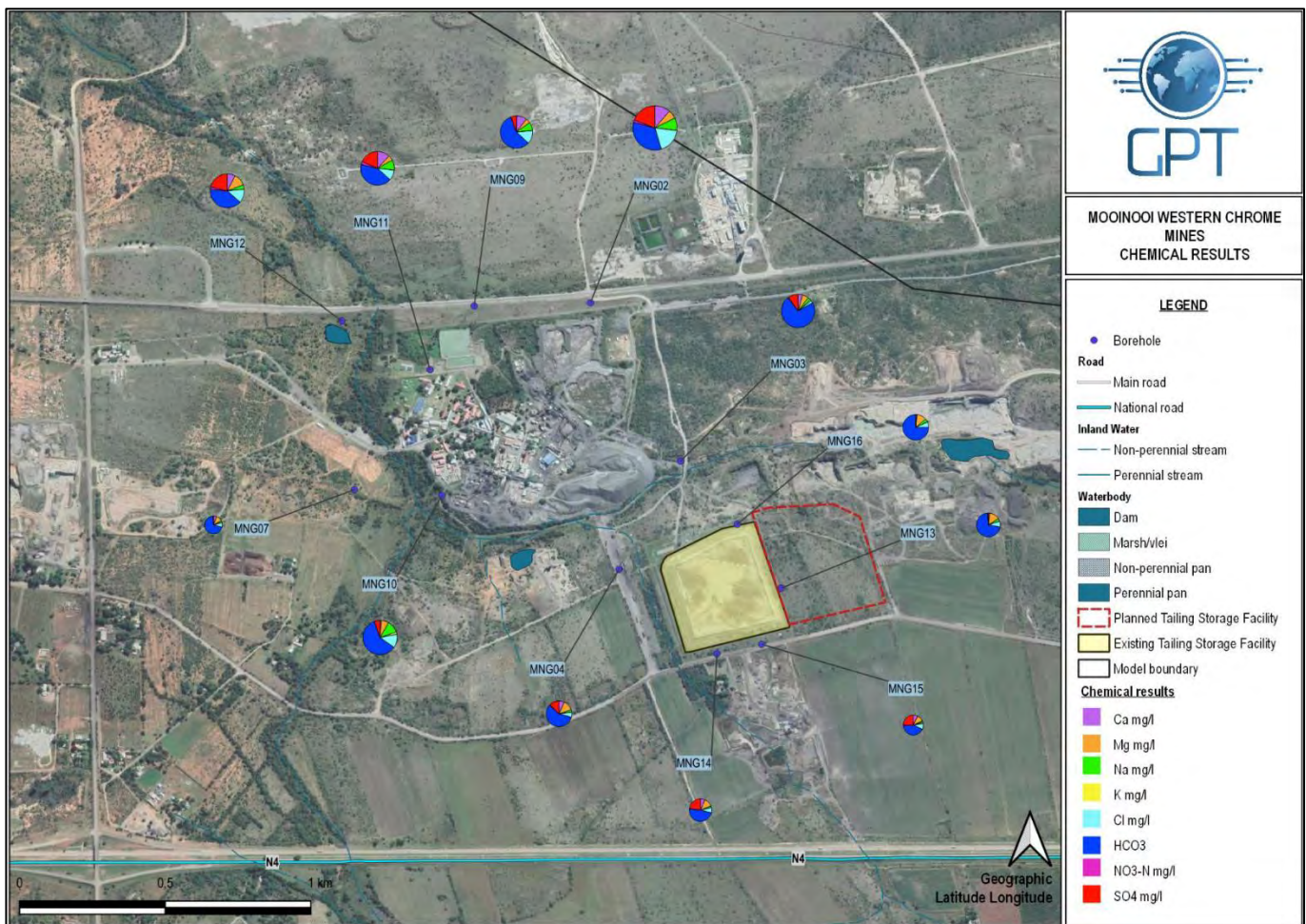


Figure 10-17: Chemistry map of the monitoring boreholes

10.5.4 Aquifer characterisation

The term aquifer refers to a strata or group of interconnected strata comprising of saturated earth material capable of conducting groundwater and of yielding usable quantities of groundwater to boreholes and /or springs (Vegter, 1994 as cited by GPT). In the light of South Africa's limited water resources, it is important to discuss the aquifer sensitivity in terms of the boundaries of the aquifer, its vulnerability, classification and finally protection classification, as this will help to provide a framework in the groundwater management process.

10.5.4.1 Aquifer vulnerability

Aquifer vulnerability assessment indicates the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. Stated in another way, it is a measure of the degree of insulation that the natural and manmade factors provide to keep contamination away from groundwater.

- Vulnerability is high if natural factors provide little protection to shield groundwater from contaminating activities at the land surface.
- Vulnerability is low if natural factors provide relatively good protection and if there is little likelihood that contaminating activities will result in groundwater degradation.

The following factors have an effect on groundwater vulnerability:

- Depth to groundwater: Indicates the distance and time required for pollutants to move through the unsaturated zone to the aquifer.
- Recharge: The primary source of groundwater is precipitation, which aids the movement of a pollutant to the aquifer.
- Aquifer media: The rock matrices and fractures which serve as water bearing units.
- Soil media: The soil media (consisting of the upper portion of the vadose zone) affects the rate at which the pollutants migrate to groundwater.



- Topography: Indicates whether pollutants will run off or remain on the surface allowing for infiltration to groundwater to occur.
- Impact of the vadose zone: The part of the geological profile beneath the earth's surface and above the first principal water-bearing aquifer. The vadose zone can retard the progress of the contaminants.

The Groundwater Decision Tool (GDT) was used to quantify the vulnerability of the aquifer underlying the site using the below assumptions.

- Depth to groundwater below the site was estimated from water levels measured after drilling of the new boreholes to be at mean of ~21.36 mbgl;
- Groundwater recharge of ~20 mm/a (4% recharge);
- Sandy clay Loam soil vadose zone;
- Gradient of 1.2 % were assumed and used in the estimation.

The aquifer vulnerability for a contaminant released from surface to a specified position in the groundwater system after introduction at some location above the uppermost aquifer was determined using the criteria described below and assuming a worst-case scenario:

- Highly vulnerable (> 60), the natural factors provide little protection to shield groundwater from contaminating activities at the land surface.
- Medium Vulnerable = 30 to 60%, the natural factors provide some protection to shield groundwater from contaminating activities at the land surface, however based on the contaminant toxicity mitigation measures will be required to prevent any surface contamination from reaching the groundwater table.
- Low Vulnerability (< 30 %), natural factors provide relatively good protection and if there is little likelihood that contaminating activities will result in groundwater degradation
- The GPT calculated a vulnerability value of 43 %, which is medium.

10.6 Biodiversity

The Terrestrial Biodiversity assessment was conducted by Redkite Environmental Solutions in August 2020. Findings and impact assessment of the report will be discussed in sections below (Section 14, also refer to Appendix 6).

A baseline assessment was conducted to establish whether any potentially sensitive species/receptors might occur on site. The South African National Biodiversity Institute's (SANBI) online biodiversity tool: The Virtual Museum and Animal Demography Unit (ADU) were used to query species lists for the 2527DA quarter degree grid cell. This was supplemented by researching all available books and peer reviewed websites.

The importance of a baseline study is to provide a reference condition to determine the current state of the environment and to draw comparisons between the potential of the area and current degradation from surrounding land uses.

Aerial photographs and satellite imagery were used to delineate potential sensitive habitat types and these areas were the focus during the assessment.

10.6.1 Flora

10.6.1.1 Biomes

The project area lies within the Savanna Biome, which is the largest biome in South Africa, covering 34.3% of the country (about 435 000 km²). It is a mixture of grasses and trees or shrubs. Savanna stretches from the Kalahari in the north-west across to the lowveld in the north-east and southwards to the lowlands of KwaZulu Natal and the Eastern Cape. It is found from sea level to about 2 000 metres above sea level. More than 5 700 plant species grow in the Savanna Biome. They include various types of grasses (e.g. Rooigras) and trees like the Baobab, Mopane, Camel Thorn and Knob Thorn.

Rain falls in summer and varies greatly across the region, from about 235 mm per year in the Kalahari to over 1000 mm per year in the east.

10.6.1.2 Vegetation types

According to the National Vegetation Map (2018) the project site falls within the Marikana Thornveld (SVcb6) vegetation type that is listed in the National List of Threatened Ecosystems (Government Gazette (2011), No. 34809, General Notice 1002), as Vulnerable.

A summarised description of the vegetation types, extracted from the CD accompanying Mucina & Rutherford (2006) (As cited by Red Kite), is presented below.

The Marikana Thornveld vegetation type occurs in the North-West and Gauteng Provinces, on plains from the Rustenburg area in the west, through Marikana and Brits to the Pretoria area in the east. The ecosystem is characterised by open *Acacia karroo* woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitat protected from fire.

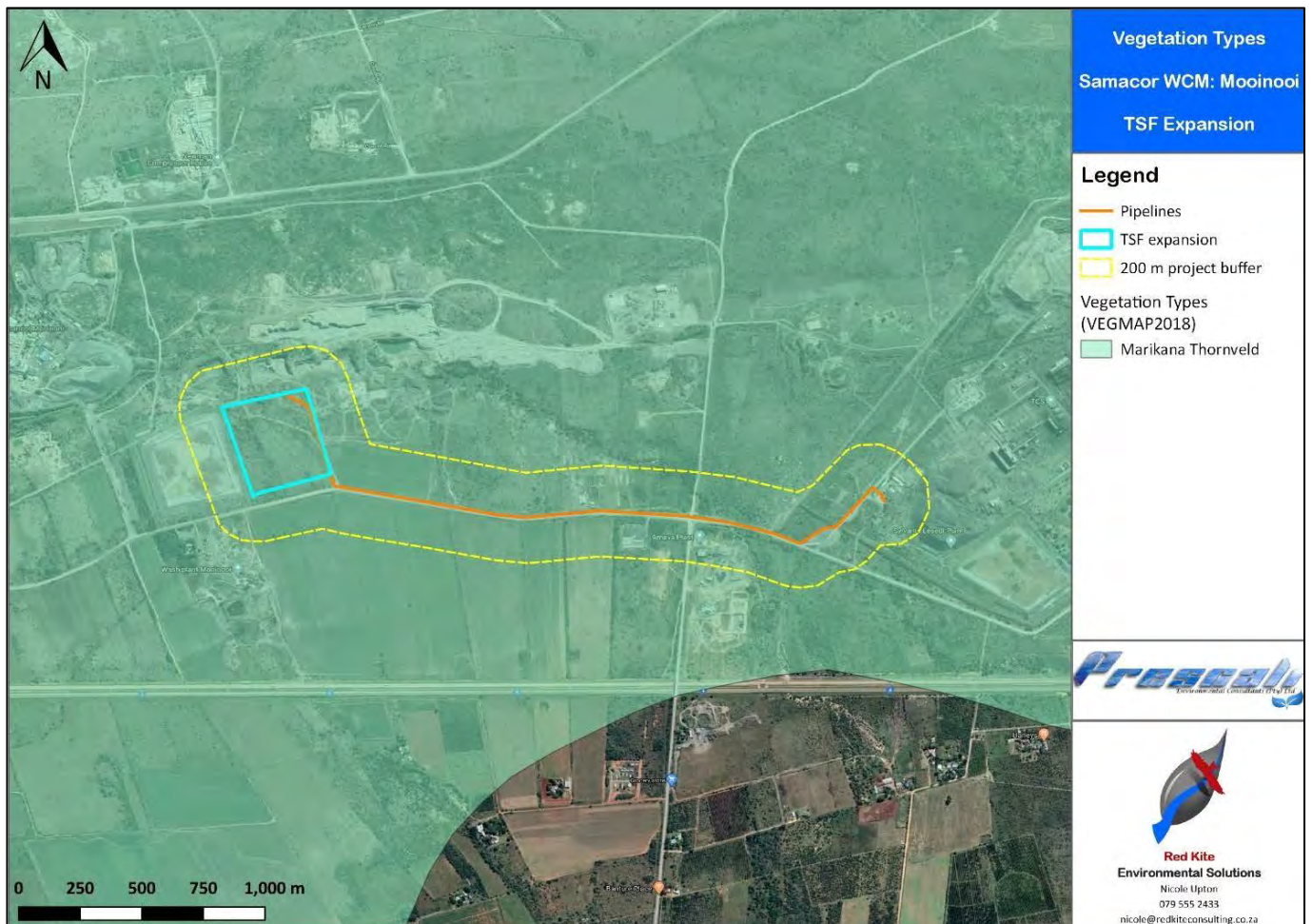


Figure 10-18: Vegetation types between Mooinooi Section and Lesedi Section (Pipeline Alt 1 indicated, the preferred pipeline is located within the 200 m buffer)

A list of expected common and dominant species in undisturbed vegetation includes the following (those with a "d" are considered to be dominant) (Mucina and Rutherford, 2006):

- **Trees⁴:** *Acacia burkei*, *Acacia caffra* (d), *A. gerrardii* (d), *A. karroo* (d), *Combretum molle* (d), *Rhus lancea* (d), *Ziziphus mucronata* (d), *Acacia nilotica*, *A. tortilis* subsp. *heteracantha*, *Celtis africana*, *Dombeya rotundifolia*, *Pappea capensis*, *Peltophorum africanum*, *Terminalia sericea*.
- **Shrubs:** *Euclea crispa* subsp. *crispa* (d), *Olea europaea* subsp. *africana* (d), *Rhus pyroides* var. *pyroides*

⁴ Most of the *Acacia* trees have been renamed. The old names are listed here.



(d), *Diospyros lycioides* subsp. *guerkei*, *Ehretia rigida* subsp. *rigida*, *Euclea undulata*, *Grewia flava*, *Pavetta gardeniifolia*, *Asparagus cooperi* (d), *Rhynchosia nitens* (d), *Indigofera zeyheri*, *Justicia flava*.

- **Graminoids:** *Elionurus muticus* (d), *Eragrostis lehmanniana* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhuthia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis nerviglumis*, *Pogonarthria squarrosa*.
- **Herbs:** *Hermannia depressa* (d), *Ipomoea obscura* (d), *Barleria macrostegia*, *Dianthus mooiensis* subsp. *mooiensis*, *Ipomoea oblongata*, *Vernonia oligocephala*, *Ledebouria revoluta*, *Ornithogalum tenuifolium*, *Sansevieria aethiopica*.

10.6.1.3 POSA Plant Species

The study area falls within the 2527DA Quarter Degree Square. Information on plant species recorded was extracted from the POSA online database hosted by SANBI, based on a 25 km x 25 km square surrounding the project area. A list of plant species that have previously been recorded in the aforementioned area (25 km x 25 km square) is provided in Appendix 6.

The results indicate that approximately 888 plant species occur within the square, consisting of 163 families. The most prominent family is Poaceae, with 107 species, followed by Fabaceae, with 72 species and Asteraceae with 71 species. Fifty-seven (57) endemic species were found to possibly occur in the area. Thirty-four (34) exotic species are known to occur within the area queried.

Table 10-8: Floral species summary for QDS (POSA)

Number of families	Number of species	SCC	Exotic species
163	888	14	34

Fourteen (14) plant species listed for the area are classified as species of conservation concern (SCC) according to the IUCN Red List status **Appendix 6** the ToPS list, their endemism, the NFA and the NWBMA.

Table 10-9: Plant SCC recorded for 2527 QDS

Species	Common name	Conservation (SCC)
<i>Adromischus umbraticola</i>	Cliff adromischus	IUCN Red List: Near Threatened
<i>Boscia albitrunca</i>	Shepherd's tree	NFA: Protected
<i>Brachystelma barberae</i>	Platvoetaasblom	NWBMA: Protected
<i>Delosperma leendertziae</i>		NWBMA: Protected
<i>Erythrophysa transvaalensis</i>	Transvaal red balloon	NFA: Protected
<i>Euphorbia cooperi</i>	Bushveld candelabra tree	NWBMA: Protected
<i>Euphorbia davyi</i>		NWBMA: Protected
<i>Euphorbia inaequilatera</i>		NWBMA: Protected
<i>Frithia pulchra</i>	Fairy elephant's feet	NWBMA: Protected
<i>Habenaria mossii</i>		IUCN Red List: Endangered
<i>Ledebouria atrobrunnea</i>		NWBMA: Protected
<i>Pittosporum viridiflorum</i>	Cheesewood	Medicinal, NFA: Protected
<i>Sclerocarya birrea</i>	Marula	Medicinal, NFA: Protected
<i>Stenostelma umbelluliferum</i>		IUCN Red List: Near Threatened

10.6.1.4 Invasive species

Invasive and exotic species tend to increase in disturbed environments (DEA & DMR, 2013, as cited by Red Kite). Therefore, the construction and operational phases of developments can increase the spread and growth of invasive species. Thirty-four (34) plant species not indigenous to South Africa were listed for the project area, fourteen (14) of which are listed as alien and invasive plant (AIP) species in NEMBA, 2004 (Act No. 10 of 2004).



Table 10-10: Alien Invasive species

Species	Common name	NEMBA AIP Category
<i>Agrimonia procera</i>	Scented agrimony	1b
<i>Araujia sericifera</i>	Moth catcher	1b
<i>Duranta erecta</i>	Forget-me-not-tree	3
<i>Opuntia engelmannii</i>	Small round-leaved prickly pear	1b
<i>Opuntia salmiana</i>	Bur cactus	1a
<i>Passiflora edulis</i>	Passion fruit	2
<i>Phytolacca dioica</i>	Belhambra	3
<i>Rubus cuneifolius</i>	American bramble	1b
<i>Senna occidentalis</i>	Stinking weed	1b
<i>Solanum mauritianum</i>	Bugweed	1b
<i>Solanum pseudocapsicum</i>	Jerusalem cherry	1b
<i>Tithonia rotundifolia</i>	Red sunflower	1b
<i>Verbena brasiliensis</i>	Brazilian verbena	1b
<i>Xanthium strumarium</i>	Large cocklebur	1b

10.6.1.5 Site Evaluation

A site survey was conducted on the 5th of August 2020.

Land uses, on and adjacent to the project area, consist of extensive historic and current mining and related activities, and historic and current agriculture.

Vegetation units were identified according to plant species composition, and previous and current land use. The state of the vegetation of the proposed expansion activities varies from being moderately modified natural vegetation to completely transformed.

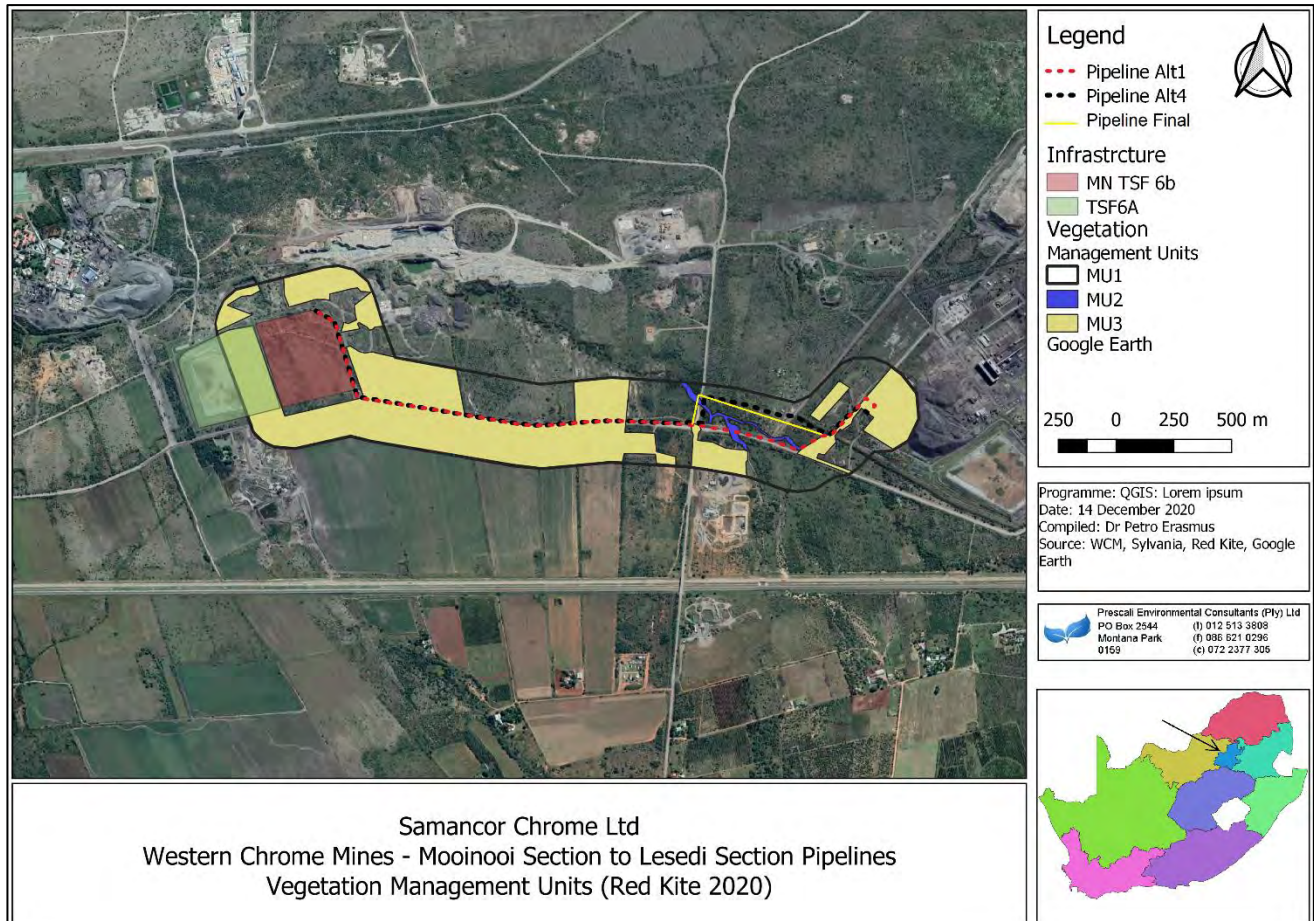


Figure 10-19: Vegetation Management Units delineated

The following broad classification of Vegetation Units (VU) was found to occur at on the proposed pipeline footprint area:

1. Thornveld (VU1);
2. Vegetation associated with streams (VU2); and
3. Transformed areas (VU3).

Vegetation Unit 1 (VU1)

This vegetation unit is located in a plain with turf soils. The VU is characterised by open thornveld that has been heavily to moderately impacted by the land uses on and around the VU, such as mining and related activities (both current and historic), access and hauls roads, footpaths, human and vehicle traffic and crop cultivation. VU1 is 74.4 ha in extent and the largest of the three Vegetation Units. Vegetation composition in this unit was found to be homogenous with low floral species diversity.

The footprint of the pipelines is located directly adjacent to the existing TSF at Mooinooi and was historically used for mining related activities but has since adequately revegetated to a satisfactory state.

Dominant woody plant species in this VU include: *Searsia engleri* (Velvet karee), *Vachellia karroo* (Sweet thorn), *Searsia lancea* (Willow crowberry), *Searsia leptodictya* (Mountain karee), *Dichrostachys cinerea* (Sicklebush) and *Asparagus larycinus* (Bushveld asparagus).

Dominant grass species recorded during the site survey included: *Heteropogon contortus* (Spear grass), *Setaria sphacelata* (Bristle grass), *Aristida canescens* (Pale three-awn), *Digitaria diagonalis* (Brown-seed finger grass), *Aristida bipartita* (Rolling grass), *Andropogon gayanus* (Blue grass) and *Enneapogon scoparius* (Bottlebrush grass).

Dominant species in the area also includes the succulent *Aloe davyana* (Spotted aloe).

One exotic species, listed in the NEMBA as invasive, was identified, namely, *Xanthium strumarium* (Large cocklebur). However, this species did not occur in high densities, but rather as scattered individuals.

The vegetation unit is classified as having a **medium sensitivity** due to the moderately disturbed state of this vegetation unit and the regional importance of the ecosystem.



Figure 10-20: Typical characteristics of VU1

Vegetation Unit 2 (VU2)

VU2 is located along the unnamed tributary of the Elandskraalspruit and intersects with the slurry and return water pipelines. VU2 is 1.6 ha in extent and the smallest of the three Vegetation Units. The vegetation associated with the riparian zone of the tributary of the Elandskraalspruit was found to have low floral diversity. Disturbances to vegetation condition included human and livestock movement, road crossings, possible sewage effluent and erosion.

The vegetation composition was largely similar to that of the general surrounding vegetation, i.e. VU1. However, two obligate wetland species were identified, namely *Cyperus* sp. (Sedge) and *Phragmites australis* (Common reed). Two facultative wetland species were identified to occur along the banks and channel of the stream, namely *Sporobolus pyramidalis* (Cat's-tail dropseed) and *Cyperus sexangularis* (Biesiesgras). The aforementioned obligate and facultative wetland species were found in small patches along the course of the stream.

Although this VU is moderately to heavily disturbed, watercourses are considered to be sensitive. The riparian areas on site are denoted as having High sensitivity.



Figure 10-21: Vegetation associated with watercourses (VU2)

Vegetation Unit 3 (VU3)

VU3 consists of existing hauls roads, current and historic mining areas and associated activities, and current and historically cultivated areas, where little or no natural vegetation remains. The proposed return water and slurry pipelines are mostly situated on areas of VU3. VU3 is 73 ha in extent.

The vegetation unit is classified as having a low sensitivity due to the state of degradation (total transformation).



Figure 10-22: Old cultivated fields in VU3 now dominated by AIP species (mining activities in background)



10.6.2 Fauna

10.6.2.1 Desktop Assessment

A desktop study was conducted to establish whether any potentially sensitive faunal species or species of conservation concern may possibly occur on site. The Virtual Museum (VM) and Animal Demography Unit (ADU) were used to compile species lists based on the sightings and data gathering from the South African Biodiversity Institute for the 2527DA QDS. The avifaunal species list was obtained from SABAP2 for both the 2540_2730 and 2540_2735 pentad.

It is important to note that a QDS covers a large area: $\pm 27 \times 25$ km (± 693 km²) and a pentad (SABAP2 Protocol) an area of $\pm 8 \times 7.6$ km (± 60.8 km²) and it is possible that suitable habitat will exist for a certain Red Data avifaunal species within this wider area within or surrounding the study site. However, the specific habitat(s) found on site may not suit Red Data species, even though it has been recorded for the QDS or pentad.

Species and habitat were identified as possibly sensitive within the framework of this study. Sensitive species were determined according to their close relationship and dependence on the vegetation type and habitat found to occur.

Appendix 6 list the faunal species for the 2527DA QDS and Table 10-11 lists all fauna species that are of conservation concern which were found during the desktop study. Only mammalian and avifaunal species with a red listed status are known to occur within the specific larger area where the development is proposed.

Table 10-11: Fauna SCC found in 2527DA QDS that may be relevant to the Samancor WCM Mooinooi section (Nationally or internationally SCC)

Common name	Species	Conservation status
Mammalian species		
South African Hedgehog	<i>Atelerix frontalis</i>	Near Threatened (2016)
Avifaunal species		
Lanner	<i>Falco biarmicus</i>	VU (Regional), LC (Global)
Falcon, Red-footed	<i>Falco vespertinus</i>	NT (Regional), NT (Global)
Sandgrouse, Yellow-throated	<i>Pterocles gutturalis</i>	NT (Regional), LC (Global)
Sandpiper, Curlew	<i>Calidris ferruginea</i>	LC (Regional), NT (Global)
Stork, Abdim's	<i>Ciconia abdimii</i>	NT (Regional), LC (Global)

The following mammals, although listed for the QDS, have been omitted within the table above as they are not expected as a possible occurrence during the development or within the area due to large scale impacts already present within the area:

- *Panthera pardus* - Leopard - Vulnerable (2016) – Not expected; and
- *Hyaena brunnea* - Brown Hyena - Near Threatened (2015) – Not expected.

These species are also listed large predators in terms of the Provincial Legislation i.e. North-West Biodiversity Management Act, 2016 (Act No. 4 of 2016).

10.6.2.2 Mammals

Thirty-three (33) mammal species were found to possibly occur within the QDS, three (3) have been included within the National Red Data List:

<i>Atelerix frontalis</i> -	Southern African Hedgehog -	Near Threatened (2016)
<i>Panthera pardus</i> -	Leopard -	Vulnerable (2016)
<i>Hyaena brunnea</i> -	Brown Hyena -	Near Threatened (2015)

Twenty-one (21) other mammalian species shown in the QDS have been listed provincially:

<i>Aepyceros melampus</i> -	Impala -	Schedule 5 NWBA ₁
<i>Alcelaphus buselaphus</i> -	Hartebeest -	Schedule 2 & 5 NWBA
<i>Connochaetes taurinus taurine's</i>	Wildebeest -	Schedule 2 NWBA
<i>Damaliscus pygargus phillipsi</i> -	Blesbok -	Schedule 2 & 5 NWBA
<i>Kobus ellipsiprymnus Philips</i>	Waterbok -	Schedule 2 NWBA



<i>Oryx gazella</i> -	Gemsbok -	Schedule 2 & 5 NWBA
<i>Redunca fulvorufula</i> -	Mountain Reedbuck -	Schedule 2 NWBA
<i>Taurotragus oryx</i> -	Common Eland -	Schedule 2 & 5 NWBA
<i>Tragelaphus strepsiceros</i> -	Greater Kudu -	Schedule 5 NWBA
<i>Canis mesomelas</i> -	Black-backed Jackal -	Schedule 4 NWBA
<i>Equus quagga</i> -	Plains Zebra -	Schedule 2 & 5 NWBA
<i>Panthera pardus</i> -	Leopard -	Listed as large Predatory animal
<i>Giraffa giraffe giraffe</i> -	South African Giraffe -	Schedule 2 NWBA
<i>Helogale parvula</i> -	Common Dwarf Mongoose	Schedule 2 NWBA
<i>Hyaena brunnea</i> -	Brown Hyena -	Listed as large Predatory animal
<i>Hystrix africaeaustralis</i> -	Cape Porcupine -	Schedule 4 NWBA
<i>Lepus saxatilis</i> -	Scrub Hare -	Schedule 4 NWBA
<i>Elephantulus myurus</i> -	Eastern Rock Elephant Shrew	Schedule 2 NWBA
<i>Procavia capensis</i> -	Cape Rock Hyrax -	Schedule 4 NWBA
<i>Paraxerus cepapi</i> -	Smith's Bush Squirrel -	Schedule 4 NWBA
<i>Crocidura fuscomurina</i> -	Bicolored Musk Shrew -	Schedule 2 NWBA

Most of these provincially listed species will only occur as game in nature reserves within the area or hunting farms and have specific range requirements. These are not supported by the habitat associated and remaining within the Mooinooi and Lesedi mines, unless occasionally and specifically only the smaller mammalian species shown above.

10.6.2.3 Avifaunal

According to data collected as part of the Southern African Bird Atlas Project 2 (SABAP2) <http://sabap2.adu.org.za>, the site falls within two (2) pentads: 2540_2730 and 2540_2735. Two hundred and twenty-nine (229) bird species were recorded for this area. Five (5) avifaunal SCC have been indicated for the specific pentads for National importance:

Falcon, Lanner -	<i>Falco biarmicus</i> -	VU (Regional), LC (Global)
Falcon, Red-footed -	<i>Falco vespertinus</i> -	NT (Regional), NT (Global)
Sandgrouse, Yellow-	<i>throated</i> -	<i>Pterocles gutturalis</i> - NT (Regional), LC (Global)
Sandpiper, Curlew -	<i>Calidris ferruginea</i> -	LC (Regional), NT (Global)
Stork, Abdim's -	<i>Ciconia abdimii</i> -	NT (Regional), LC (Global)

However, the following species are also provincially listed:

Buzzard, Steppe -	<i>Buteo vulpinus</i> -	Schedule 2 NWBA
Cormorant, White-breasted -	<i>Phalacrocorax carbo</i> -	Schedule 2 NWBA
Crake, Black -	<i>Amaurornis flavirostris</i> -	Schedule 2 NWBA
Falcon, Lanner -	<i>Falco biarmicus</i> -	Schedule 2 NWBA
Falcon, Peregrine -	<i>Falco peregrinus</i> -	Schedule 2 NWBA
Falcon, Red-footed -	<i>Falco vespertinus</i> -	Schedule 2 NWBA
Grebe, Great Crested -	<i>Podiceps cristatus</i> -	Schedule 2 NWBA
Harrier-Hawk, African -	<i>Polyboroides typus</i> -	Schedule 2 NWBA
Ibis, African Sacred -	<i>Threskiornis aethiopicus</i> -	Schedule 2 NWBA
Kingfisher, Giant -	<i>Megaceryle maximus</i> -	Schedule 2 NWBA
Sandgrouse, Yellow-	<i>throated</i> - <i>Pterocles gutturalis</i> -	Schedule 2 NWBA
Sandpiper, Curlew -	<i>Calidris ferruginea</i> -	Schedule 2 NWBA
Sandpiper, Marsh -	<i>Tringa stagnatilis</i> -	Schedule 2 NWBA
Sandpiper, Wood -	<i>Tringa glareola</i> -	Schedule 2 NWBA
Sparrow, Great -	<i>Passer motitensis</i> -	Schedule 2 NWBA
Stork, Abdim's -	<i>Ciconia abdimii</i> -	Schedule 2 NWBA
Stork, White -	<i>Ciconia</i> -	Schedule 2 NWBA

The site falls within the Magaliesberg Important Birding Area (IBA). Important species such as the *Gyps coprotheres* breeds at two main colonies within this IBA—the larger Skeerpoort (25°45'S 27°45'E) and the sister colony at Robert's Farm (25°50'S 27°17'E)—as well as a satellite colony at Nooitgedacht. Many other raptor species have been recorded at Skeerpoort, including *Gyps africanus* and *Torgos tracheliotus*. In other areas, patches of grassland are known to hold small numbers of *Grus paradisea*. The Skeerpoort area is located approximately 20 km towards the East and South east of the Mooinooi and Lesedi operations.



Since the site is fairly disturbed, it could be stated that none of these sensitive species known for the IBA are likely associated with Mooinooi and Sylvania Lesedi site on a regular basis and the habitat found here is likely not of significant value to these species. However, the sensitive species identified for the pentad could occur within the immediate area of the mines.

10.6.2.4 Butterflies

Eighty-seven (87) butterfly species were found for the 2527DA, all of which are categorized as Least Concern by SANBI. Five (5) species have been provincially listed:

<i>Charaxes candiope</i> -	Green-veined charaxes -	Schedule 2 of NWBA
<i>Charaxes chittyi</i> -	Chitty's charaxes -	Schedule 2 of NWBA
<i>Charaxes jahluca rex</i> -	Pearl-spotted charaxes -	Schedule 2 of NWBA
<i>Charaxes saturnus Saturn's</i> -	Foxy charaxes -	Schedule 2 of NWBA
<i>Charaxes vansoni</i>	Van Son's charaxes -	Schedule 2 of NWBA

10.6.2.5 Other invertebrates

One (1) species of Dung beetle, five (5) species of Odonata and one (1) species of Scorpion were recorded for the QDS in historical records, all of which has a Least Concern rating.

All Dung beetles are listed under Schedule 2 of the North West Biodiversity Act (NWBA).

10.6.2.6 Reptiles

Twelve (12) reptile species were recorded for the QDS. No species were awarded with a red listed status on the SANBI Database. However, the following species have been listed provincially:

<i>Cordylus vittifer</i> -	Common Girdled Lizard -	Schedule 2 NWBA
<i>Gerrhosaurus flavigularis</i> -	Yellow-throated Plated Lizard -	Schedule 2 NWBA
<i>Varanus niloticus</i> -	Water Monitor -	Schedule 2 NWBA

10.6.2.7 Amphibians

Fifteen (15) amphibian species were listed within this QDS and none of these species were shown as red listed for the QDS.

10.6.2.8 Site Evaluation (Field Survey)

A site assessment was conducted for the development on the 5th of August 2020.

The following image is provided to show the different zones of habitat available and condition thereof. The site and surrounding land consisted of various land impacted to various degrees:

- Mining and other completely transformed areas;
- Agricultural and farming lands;
- Tributaries (non-perennial); and
- Transformed secondary habitat and vegetation.

The pipeline will be implemented along the main route between the Lesedi Tailings retreatment plant and Mooinooi section and will carry slurry towards Lesedi and return water back from Lesedi to the Mooinooi operation. The route along the pipeline is characterised by sections of agriculture, some natural terrain similar to those encountered at the TSF expansion area and the river crossing section.



Figure 10-23: TSF 6b view towards the existing TSF 6a area

10.6.2.9 Species encountered during the field assessment

Fauna species observed during the site visit are indicated below.

Table 10-12: Animal species sighted during site visit

Family	Species	Common Name	Sighting/finding	Status and IUCN
Pisauridae	<i>Perenethis simoni</i>	Nursery web spider	Sightings	Least Concern
Nymphalidae	<i>Byblia ilithyia</i>	Spotted Joker	Sighting	Least Concern
Nymphalidae	<i>Danaus chrysippus</i>	African Monarch	Sighting	Least Concern
Nymphalidae	<i>Junonia hierta</i>	Yellow Pansy	Sightings	Least Concern
Reptile No reptile species observed				
Amphibians No amphibians observed				
Mammalians				
Leporidae	<i>Lepus saxatilis</i>	Scrub hare	Sightings of dung on TSF expansion footprint next to proposed pipeline	Least Concern (2016)
Hystriidae	<i>Hystrix africaeaustralis</i>	Cape porcupine	Sighting of quills	Least Concern (2016)
Avifaunal				
Coraciidae	<i>Coracias caudatus</i>	Lilac-breasted Roller	Sightings along road	Least Concern
Accipitridae	<i>Elanus caeruleus</i>	Black-Shouldered Kite	Sighting	Least Concern
Turnicidae	<i>Turnix sylvaticus</i>	Common buttonquail	Sightings	Least Concern
Leiotherichidae	<i>Turdoides jardineii</i>	Arrow-marked Babbler	Sightings	Least Concern
Estrildidae	<i>Estrilda astrild</i>	Common waxbill	Sightings at river crossing	Least Concern
Numididae	<i>Numida meleagris</i>	Helmeted guineafowl	Feathers, Sightings	Least Concern
Ploceidae	<i>Ploceus intermedius</i>	Lesser masked weaver	Sighted	Least Concern
Ploceidae	<i>Euplectes afer</i>	Yellow-crowned bishop	Sighted	Least Concern

10.6.2.10 Sensitivity and conservation status

According to the National Vegetation Map (2018) the project site falls within the Marikana Thornveld (SVcb6) vegetation type. This ecosystem is listed in the National List of Threatened Ecosystems [Government Gazette (2011), No. 34809, General Notice 1002], as Vulnerable.

According to the North West Conservation Plan the project footprints falls within areas categorised as CBA2, ESA1 and ESA2.

The proposed expansion activity footprint and existing mines are located within the Transition Zone of the Magaliesberg Biosphere Reserve (MBR), which is also an Important Birding Area (2015). The Magaliesberg Protected Natural Environment, which is a Protected Area in terms of the NEMPAA, is located approximately 5 km to the south of the project footprint.

The thornveld vegetation unit (VU1) was rated as having a Moderate sensitivity, based on the moderately to heavily disturbed condition of the vegetation and the absence of SCC observed. Consideration was given to the Vulnerable conservation status of the Marikana Thornveld and the biodiversity category given by the NWBSP.

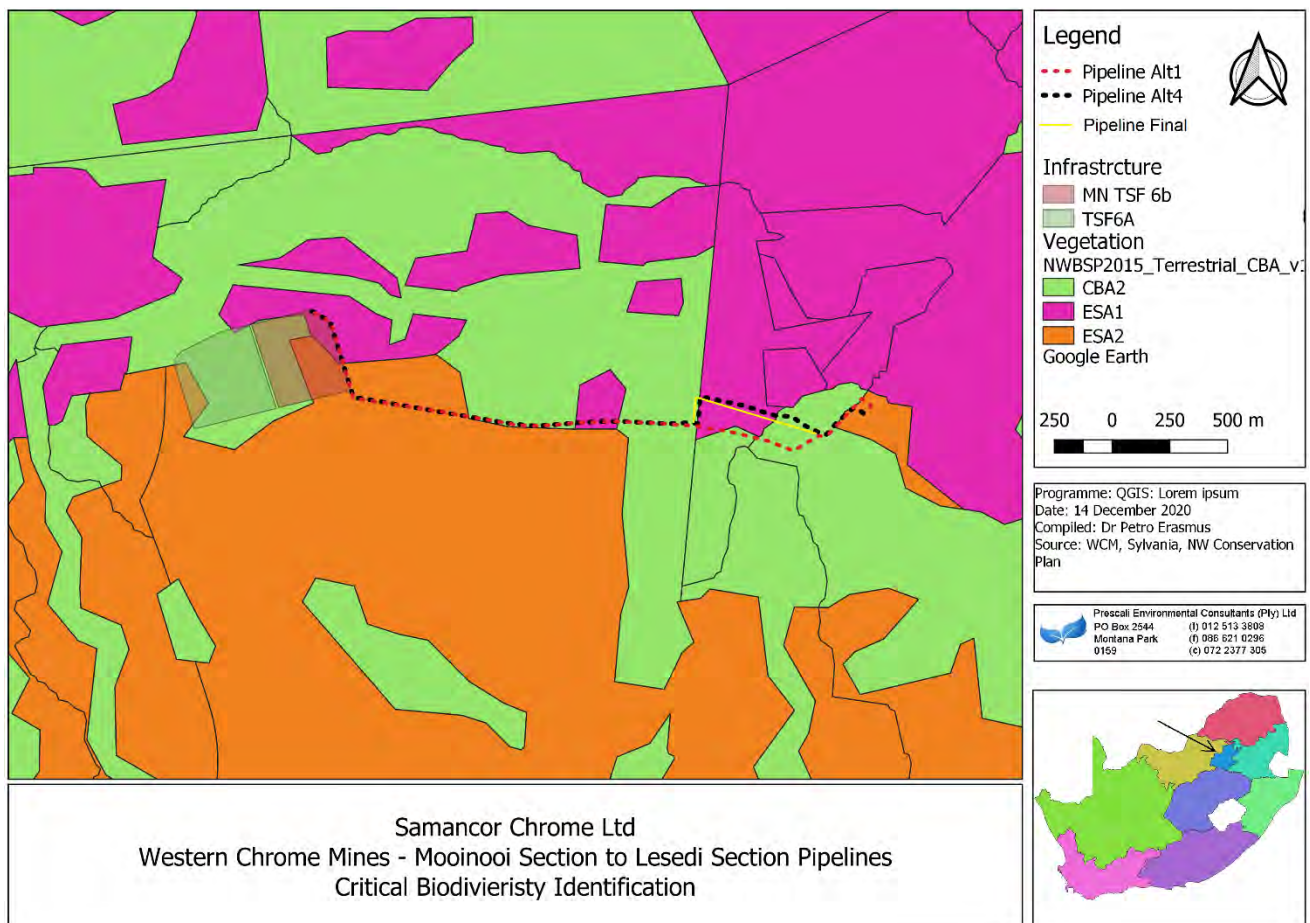


Figure 10-24: Sensitivity Map

10.7 Visual

A visual Impact Assessment study for the proposed pipeline was conducted by Eco-Elementum Environmental & Engineering in August 2020 Appendix 6.

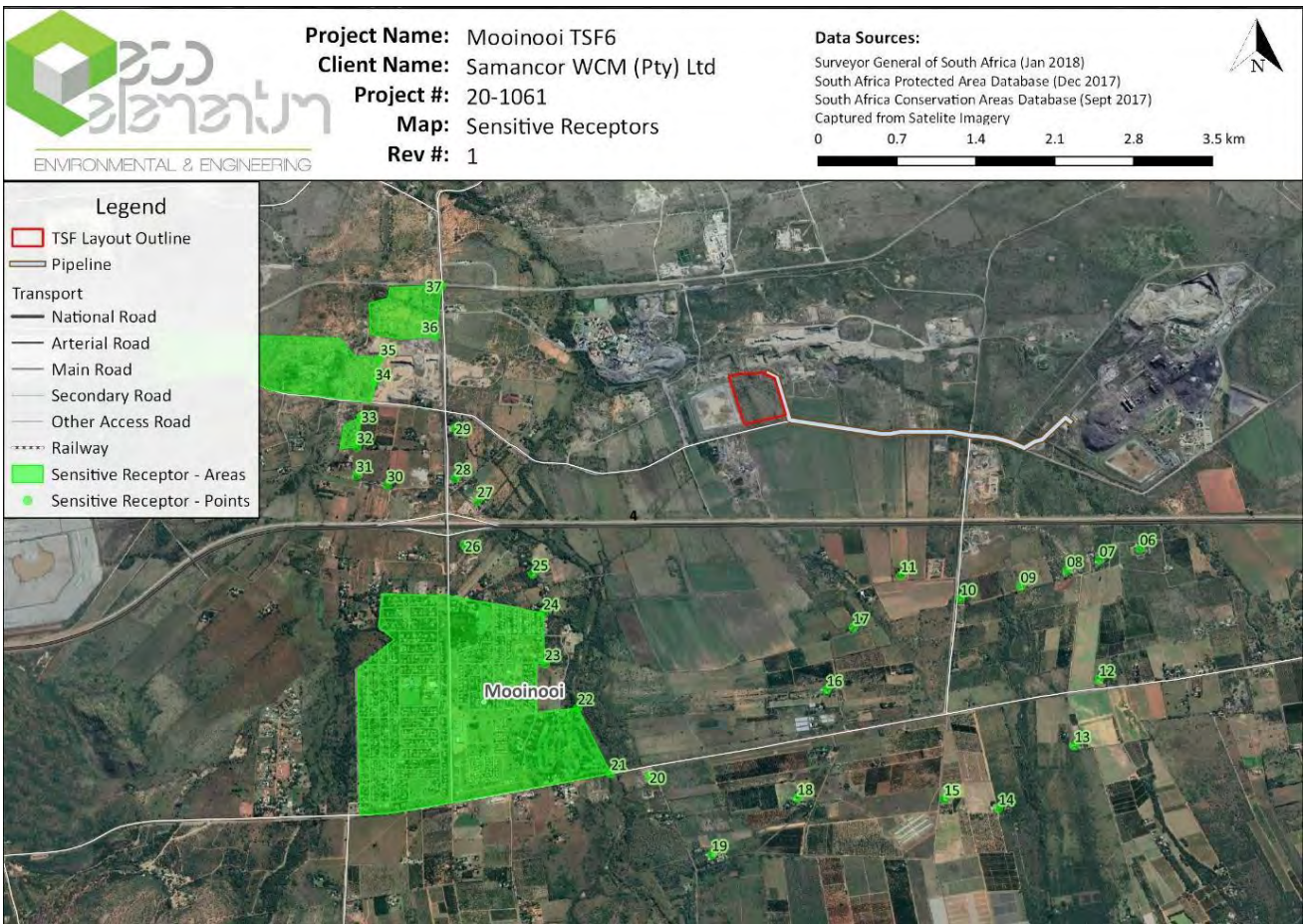


Figure 10-25: Population areas within close proximity of the proposed Mooinooi – Lesedi pipelines (option Alt 1 indicated)

From a desktop study of satellite imagery various sensitive receptors in the form of human habitation areas, consisting of the town of Mooinooi to the south-west of the proposed project area and various human settlements to the south, south-east and west of the project area are also identified. It should be noted that the sensitive receptors in the area may differ from those identified as not all areas may have been identified from the imagery successfully.

The proposed operation is situated on flat ground. The Magaliesberg Mountain range are found ~10 km to the south of the project area as can be seen in **Error! Reference source not found.**

10.7.1 New infrastructure

The proposed Mooinooi – Lesedi pipeline, though it must be noted that no complete detail of the exact structures were available at the time of this report and general height and location assumptions were made where applicable.

Table 10-13: Maximum height of the proposed Pipeline.

Description	Height (m)
Pipeline	0.2

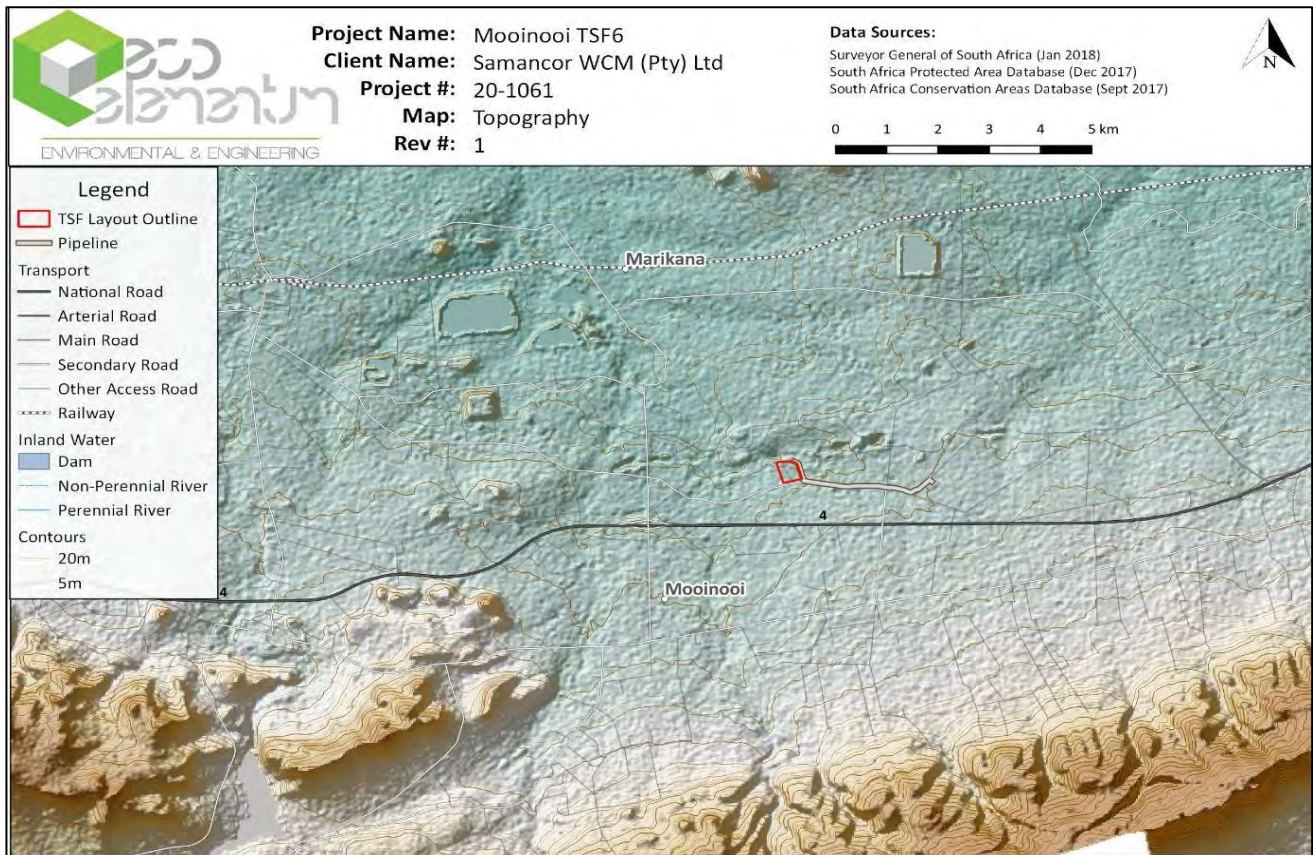


Figure 10-26: Map showing the topography surrounding the proposed Pipeline project (option Alt 1 indicated)

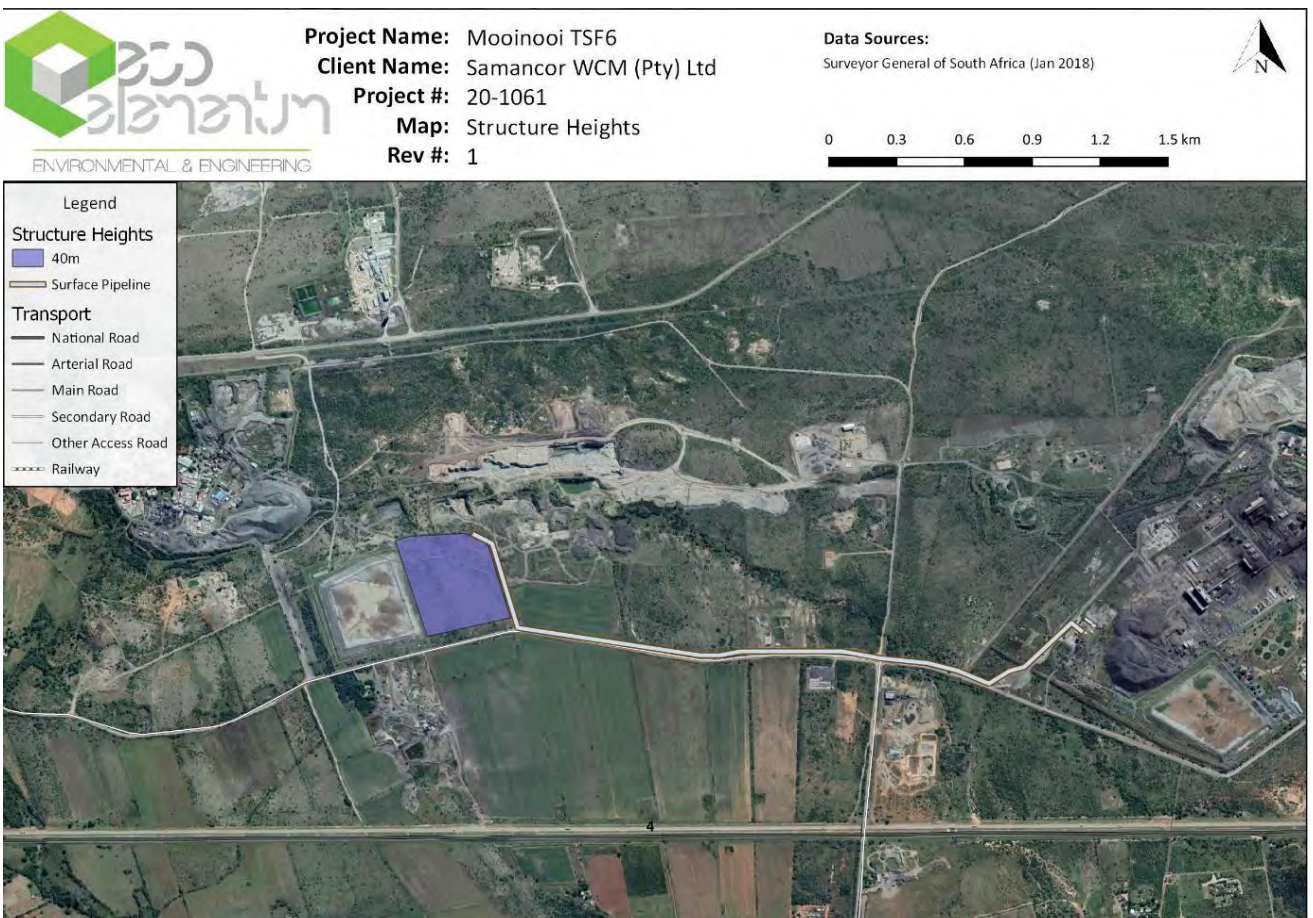


Figure 10-27: Infrastructure surface heights (Option Alt 1 indicated)



10.7.2 Sense of place

The concept of “a Sense of Place” does not equate simply to the creation of picturesque landscapes or pretty buildings, but to recognize the importance of a sense of belonging. Embracing uniqueness as opposed to standardization attains quality of place. In terms of the natural environment, it requires the identification, a response to and the emphasis of the distinguishing features and characteristics of landscapes. Different natural landscapes suggest different responses. The sense of place is created by the mining and light agricultural activities in the area. The proposed operational area is an expansion of an existing mining operation.

10.8 Heritage

A phase 1 Heritage Impact Assessment was conducted by Apelser Archaeological Consulting in July 2020 Appendix 6. No sites, features or material of cultural heritage (archaeological and/or historical) origin or significance was identified in the study area during the physical assessment. The area has been fairly extensively disturbed in the recent historical past by agricultural activities such as ploughing/crop growing and cattle grazing, while recent mining-related activities has also impacted. This includes roads, electrical powerlines and servitudes. The area is also characterized by turf soils and large-scale settlement during the Iron Age would not have been favoured here. LIA settlements would have been located closer to and on the surrounding ridges and hills.

10.9 Soil and Land capability

The pipeline alignment fall on land classified as Land Type Ea3 (Terra Africa Report dated 2020 attached in Appendix 6) thus the crest and mid slope positions may differ and a small fraction of the area consist of land with steep slope (1% or less of the total area). Mid-slopes (with slope ranging between 1 and 3%), is the most dominant landscape position in the Land Type Ea3 area. The crest areas have slope ranging between 0 and 2% and 15% of the total land type area consists of toe-slope positions while 9% consists of valley bottoms.

With regards to long term grazing capacity the pipeline route has an average long term grazing capacity of 10/SLU, thus approximately 10 ha of land is required to provide sufficient vegetation to maintain an animal with a weight of 450 kg. Sufficient fodder intake for an animal of this size, is considered to be an average of 10kg dry mass per day. The most important inclusion in this data, is that grazing by livestock should be able to continue without the degradation of the vegetation and soil of the area.

10.9.1 Soil forms

From the field assessment six different soil forms were identified (note the assessment focused on Pipeline Alt 1 as Pipeline Alt4 / Final Route became the preferred option after the assessment was completed, the information from the specialist assessment was extrapolated and using remote sensing Figure 10-28 was compiled):

- Arcadia: The Arcadia soil form consists of vertic topsoil that is between 0.6 and 1.2 m in depth. The vertic topsoil is underlain by lithic material (gleying is absent from the lithic material in this area). The lithic material resembles the underlying rock material but shows signs of weathering. The vertic horizon has dark grey to black colour and a silty clay-loam texture. The Arcadia soil form occurs together with the Rustenburg form along the eastern side of the pipeline alignment. In this area, a preferential flowpath is present in a slight depression where the vertic topsoil has eroded away over time.
- Rustenburg: The Rustenburg soil form has been grouped together for the soil classification map as the soil profiles of this form are similar to that of the Arcadia form, except for the nature of the underlying material. In the case of the Rustenburg form, the effective depth of the soils are limited by hard rock that can be found between 0.6 and 1.2 m. Together with the Arcadia soil form, this soil group are found at around 3 ha within the study area.
- Mkuze: Approximately 3.3 ha of the study area consist of the Mkuze soil form (directly east of the proposed Mooinooi TSF expansion area (next to proposed Pipeline route). The Mkuze soil form consists of a thick vertic horizon with very dark to black soil colour throughout the horizon. Although depth-limiting material may be present, it was not found within the first 1.5 m of the profiles observed. The texture of this horizon is dominated by the silt and clay fractions and surface cracks are visible. Where the vertic



surface is exposed (in the crop fields in this area) has fine peds as opposed to large clods, indicating that the vertic horizon self-mulches. Polished slickensides were observed on the soil clods removed from the auger from around 0.45 m and deeper.

- Immerpan: Approximately 8.9 ha of the Immerpan soil form is present within the study area in two different sections. Undisturbed Immerpan profiles occur within the proposed Moionooi TSF expansion area next to the pipeline route on the western side of the study area. These profiles are surrounded by Technosols (already affected by anthropogenic activities). The second area is around the middle section within the buffered area of the pipeline alignment, both north and south of the Technosol. The Immerpan soil form consists of a melanic topsoil horizon between 0.4 and 0.65 m thick, overlying a hard carbonate horizon (Figure 13B). The melanic horizon has dark greyish to brown colour. The melanic horizon was tested with the 10% cold hydrochloric acid solution and carbonates are present here. Scattered lime nodules were visible on the surface of the Immerpan form.
- Nkonkoni: The Nkonkoni soil form is present in 2.4 ha of the middle section of the 50 m buffered area around the pipeline alignment, directly west of the Arcadia/Rustenburg soil group. There is an abrupt soil colour transition between the area with Nkonkoni soils and the surrounding areas. While both the Immerpan and the Arcadia/Rustenburg soils east and west of this area have dark grey to black and dark brown colour, the Nkonkoni soil has red topsoil and subsoil. This form consists of orthic topsoil (0.3 m thick) with slight structure underlain by red apedal subsoil that reaches to depths of about 1.2 m. The subsoil is underlain by lithic material.
- Technosol: Within the study area, Technosols occupy approximately 29.5 ha of land. Technosols are a soil group that encompasses soils that have been so significantly altered by human activities that it can no longer be classified as natural profiles. Within the study area, the Technosols are associated with areas previously affected by mining infrastructure and subsequent rehabilitation as well as areas where existing infrastructure such as roads and the Lesedi retreatment facility are present. Within the group of Technosols, differentiation is made between transported soil and materials (Witbank), chemically polluted soil (Industria) and anthropogenic open excavations are present (Cullinan). As the areas already affected by infrastructure development and mining consist of a combination of these, the entire area has been classified as Technosols.

10.9.2 Land capability

Land capability (as per the chamber of mines Classification system) is Arable / Grazing or Wilderness land. Note that the assessment focused on Pipeline Alt 1 as Pipeline Alt4 / Final Route became the preferred option after the assessment was completed, the information from the specialist assessment was extrapolated and using remote sensing Figure 10-29 was compiled.

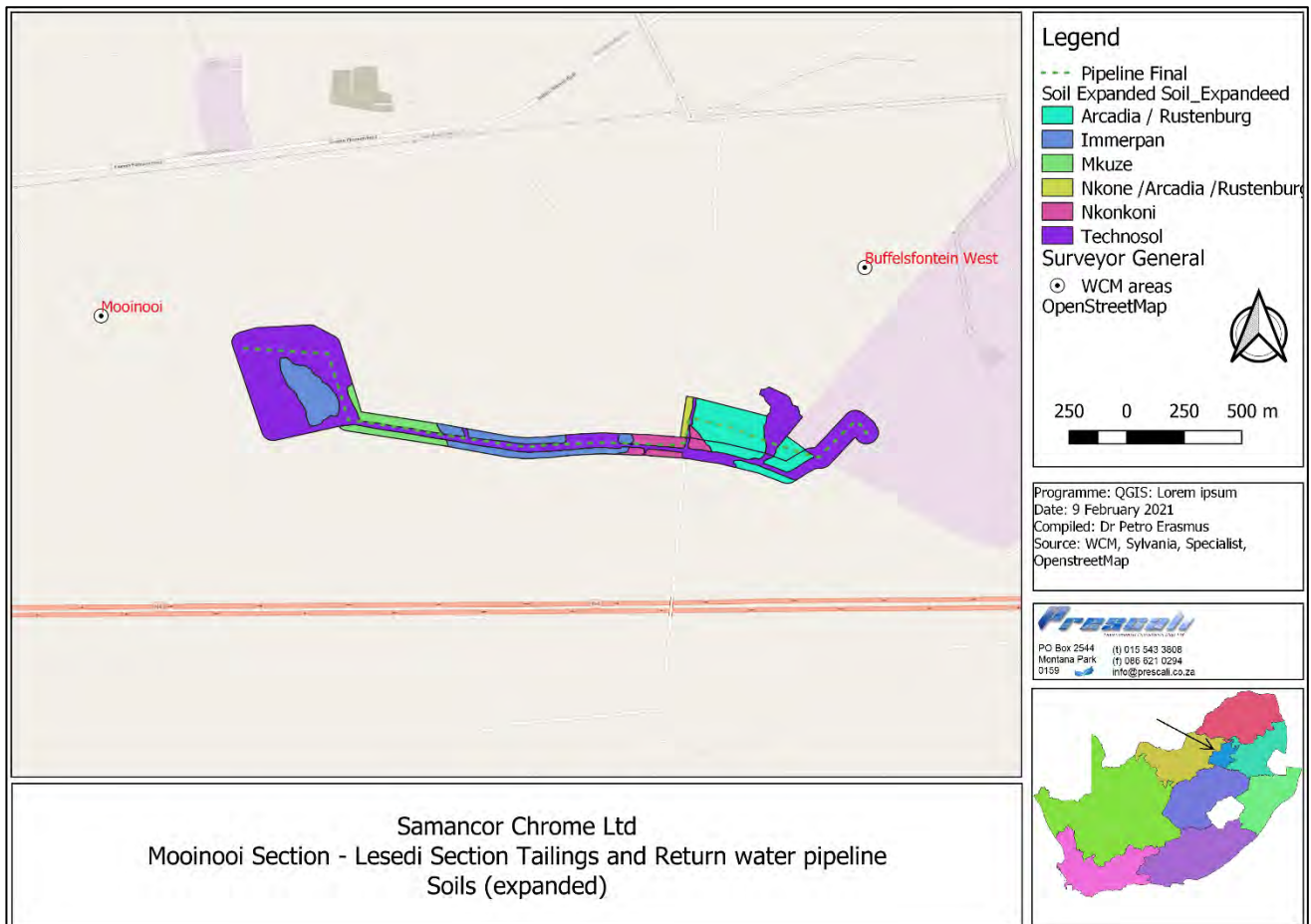


Figure 10-28: Soil classification

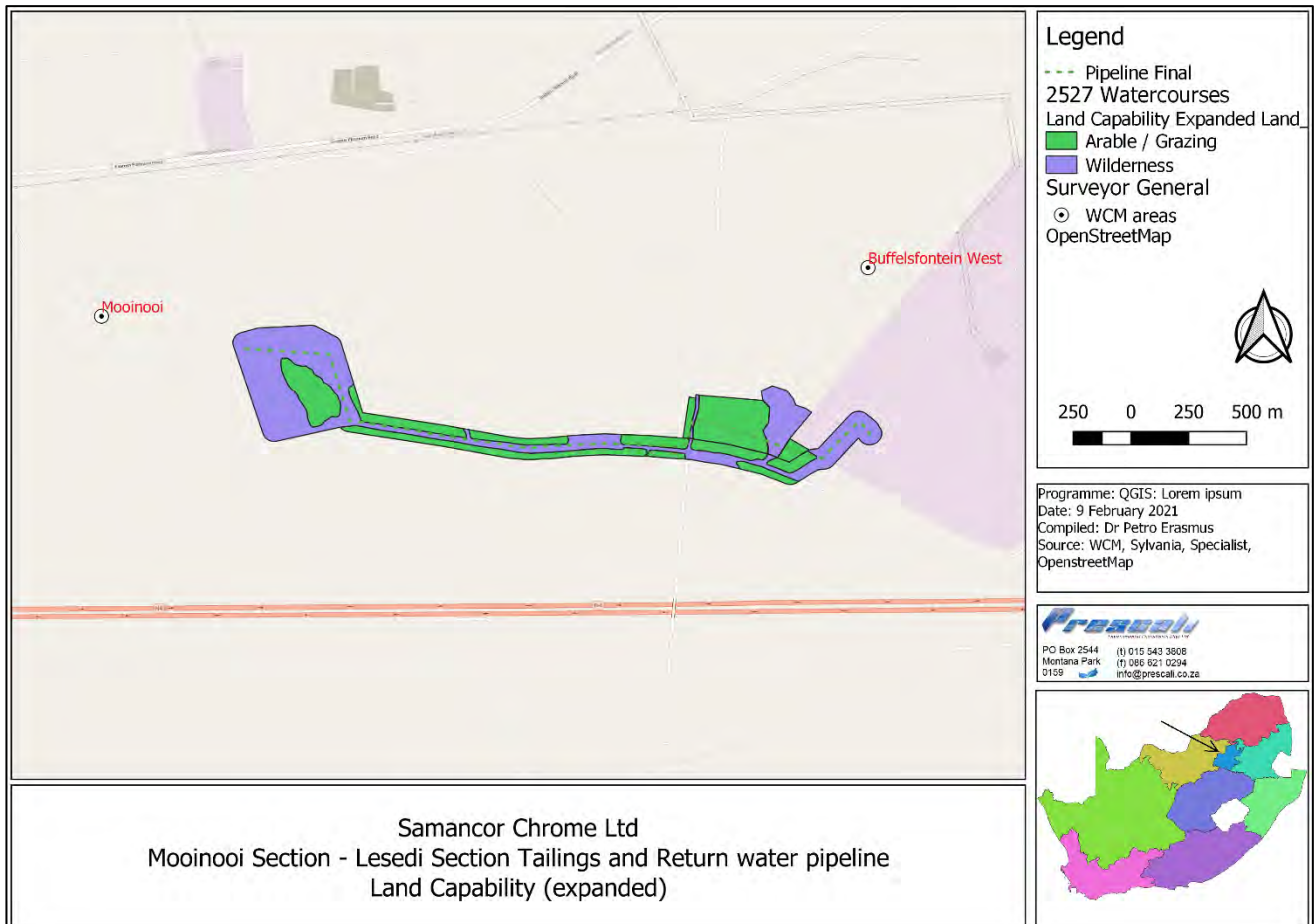


Figure 10-29: Land Capability map



10.10 Socio- Economy

The Mooinooi Section is situated near the towns of Mooinooi and Brits, approximately 100 km West of Pretoria, on the Western Limb of the Bushveld Igneous Complex, Northwest Province. The site falls within municipal boundaries of the Bojanala District Municipality and the Madibeng Local Municipality (Ward 27). Madibeng is strategically located in relation to Gauteng, Limpopo, Harare and the Maputo Harbour and is positioned on the Heritage Route, linking a World Heritage Site with the Pilanesberg and Madikwe Game Reserves. It is known for its diverse economy which includes agriculture, mining, manufacturing and tourism.

10.10.1 Demography

Madibeng is classified as a category B Municipality, functioning through the Executive Mayoral System. The Municipality was recently demarcated into 41 wards and the Municipal Council comprises of 82 Councillors, (of which 10 are members of the Mayoral Committee), with a full- time Speaker, Chief Whip and Executive Mayor.

Table 10-14: Summary of Madibeng Local Municipality (Republic of South Africa, 2019)

Population	2016	2011
	536 110	475 796
Age Structure		
Population under 15	29.40%	25.70%
Population 15 to 64	65.90%	69.30%
Population over 65	4.70%	5.00%
Dependency Ratio		
Per 100 (15-64)	51.8	44.4
Sex Ratio		
Males per 100 females	115.4	113.7
Population Growth		
Per annum	2.71%	n/a
Labour Market		
Unemployment rate (official)	n/a	n/a
Youth unemployment rate (official) 15-34	n/a	n/a
Education (aged 20 +)		
No schooling	5.10%	7.60%
Matric	32.20%	27.10%
Higher education	6.80%	7.20%
Household Dynamics		
Households	193 364	160 041
Average household size	2.8	2.9
Female headed households	29.50%	30.20%
Formal dwellings	63.30%	59.00%
Housing owned	67.70%	54.00%
Household Services		
Flush toilet connected to sewerage	27.30%	27.30%
Weekly refuse removal	35.50%	25.80%
Piped water inside dwelling	16.00%	22.30%
Electricity for lighting	88.00%	80.90%

Table 10-15: Madibeng Local Municipality Demographic Statistical overview, as per Census 2016

Comparative Periods	2011	2016
Black African	424 874	485 639
Coloured	3 910	4 773
Indian Or Asian	2 410	2 946



White	43 556	49 030
TOTAL	474 750	542 388

Table 10-16: Access to basic services

Comparative Periods	2011	2016
Piped water inside dwelling	32 454	41 414
Piped water in yard	74 781	89 962
Communal piped water: less than 200 m from dwelling (At RDP-Level)	13 255	19 722
Communal piped water: more than 200 m from	10 580	20 647

10.10.2 Employment

The most prominent economic activities in Madibeng Local Municipality include manufacturing, mining and agriculture (Madibeng Local Municipality, 2018). Mining is tending to out-perform the agriculture sector. The area is the world's third largest chrome producer and includes the richest Platinum Group Metals Reserve (situated on the Merensky Reef). Manufacturing is the dominant sector, with motor industry related activities predominant.

10.11 Socio-economic Environment

Although the town of Mooinooi is approximately 2.2 km to the south of Mooinooi Section the socioeconomic study focussed on communities that are closer to the project site and/or that could be affected to a greater degree. These communities include Bapong, Majakaneng, Modderspruit/Tornado, the informal settlements adjacent to the project site and the communities of farms and smallholdings.

The populations of Mooinooi, Bapong, Majakaneng and Modderspruit/Tornado were determined during the 2011 census (<http://census2011.adrianfrith.com/place/66>) as follows:

- Mooinooi: 4,733 (5.59 km²);
- Bapong: 15,468 (11.71 km²);
- Majakaneng: 22,683 (5.96 km²); and
- Modderspruit/Tornado: 16,851 (4.68 km²).

Compared to the 2001 census whereby 347,578 people were recorded in the Madibeng Municipality the 2011 census (http://www.statssa.gov.za/?page_id=993&id=madibeng-municipality) recorded 477 381 residents. This is an increase of 37.456% in population or a growth rate of 3.17%.

10.11.1 Employment/Unemployment Figures

From the 2011 (http://www.statssa.gov.za/?page_id=993&id=madibeng-municipality) census Madibeng Municipality has an Unemployment rate of 30.4% which is a decrease from the 2001 figure of 41.9%.

From a social perspective the limited achievements amongst the local population in attaining formal education (Table 10-17), let alone matric certificates is highly problematic for local development. In the three large residential areas in the vicinity of the mine development, Majakaneng, Modderspruit/Tornado and Bapong, previously it was determined that 78.7% of the population fall outside of the identified professional, skilled and semiskilled categories. The lack of skills and high unemployment rate, leads to a critical lack of income (Table 10-18). A significant consequence is the regional outmigration by economically active people, usually men, further reducing the skills base and decreasing the number of income earners creating increasing levels of dependency (Table 10-19)

Table 10-17: Educational levels (http://www.statssa.gov.za/?page_id=993&id=madibeng-municipality)

Place	No Schooling aged 20+	Higher Education aged +20	Matric aged +20
Modderspruit	8.1%	1.5%	25.8%
Bapong	5.8%	3%	32.7%
Majakaneng	12.5%	2.2%	19.5%
Mooinooi	1.4%	12%	50.5%



Table 10-18: Income (http://www.statssa.gov.za/?page_id=993&id=madibeng-municipality)

Income	Mooinooi	Bapong	Majakaneng	Modderspruit
No income	15%	11,9%	13%	14,5%
R1 - R4,800	0,5%	1,9%	2,7%	2,1%
R4,801 - R9,600	0,7%	4,3%	5,9%	3,9%
R9,601 - R19,600	6,4%	12,8%	16,6%	11,6%
R19,601 - R38,200	6,7%	17%	24,9%	20,6%
R38,201 - R76,400	7,7%	29,3%	23,3%	31,3%
R76,401 - R153,800	13,1%	16,3%	9,6%	12%
R153,801 - R307,600	26,1%	4,9%	2,7%	3,1%
R307,601 - R614,400	18%	1,3%	0,6%	0,7%
R614,001 - R1,228,800	4,5%	0,2%	0,3%	0,1%
R1,228,801 - R2,457,600	0,5%	0%	0,2%	0,1%
R2,457,601+	1%	0%	0,2%	0,1%

Table 10-19: Working age percentage and Dependency ratio

Location	Working Age (15-64)	Dependency ratio
Mooinooi	75.1	33.1
Modderspruit	68.3	46.3
Majakaneng	67.1	49.1
Bapong	68.5	46

10.11.2 Employment Environment

The economic profile of the province indicates a relatively strong economy, contributing approximately 6.6% to the national Gross Domestic Product (GDP) in 2004. The main economic sector, mining, accounted for 25.6% of Gross Geographic Product (GGP) in the province and employed 17.8% of the formal workforce. Mining remains the key sector for the province and developments such as the one proposed in this report provide a major source of income for the province, albeit with a large level of profit leakage into Gauteng. The dominance of mining in the region, employing 25% of the population, further shows the strength of the sector regionally. The area surrounding Rustenburg and Brits boasts the largest single platinum-production area in the world.

In 2013, the Madibeng Local Municipality's economy was valued at R549 million in current prices and it contributed:

- 26.8% to the District's economy;
- 13.8% to the economy of the North West Province, which accounted for;
- 0.8% of the national economy (Quantec (2016) as published in Fourie (2016)).

The economic activities in the Local Municipality are predominantly driven by the mining (22.8% of Local Municipality GDP) sectors. A comparison of the Growth rates from 2004 till 2013 is provided in Figure 10-30.

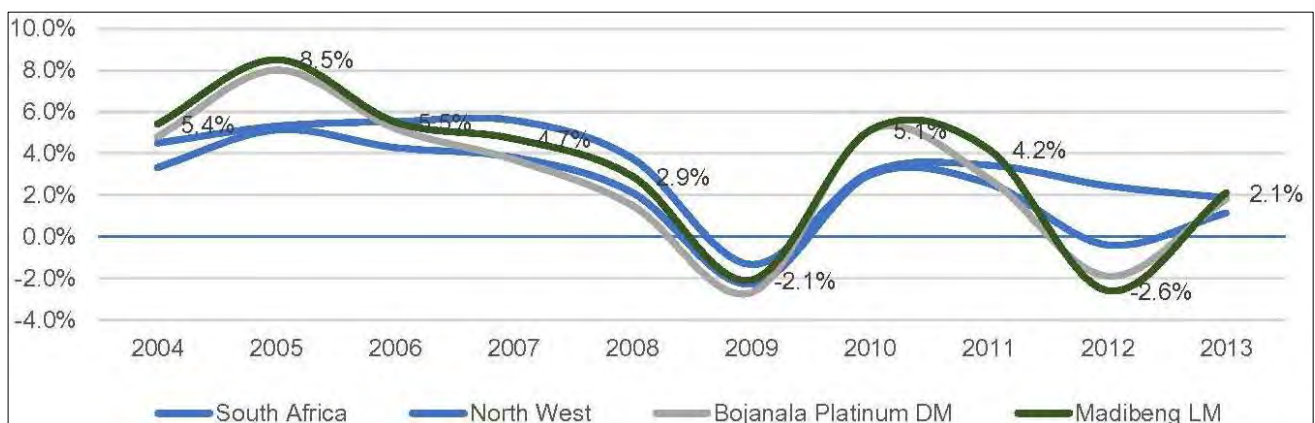


Figure 10-30: Growth rates for South Africa, the North West Province, Bojanala Platinum District Municipality and Madibeng Local Municipality

10.12 Description of the current land uses

Land use includes mining and industrial, access roads, wilderness land, agriculture fields, and informal settlements, refer to Figure 10-31.

10.13 Description of specific environmental features and infrastructure on the site

The proposed pipeline will be located within the existing access road servitude area for most of the pipeline. It will cross the Buffelsfontein spruit on portion 161 of the farm Elandskraal 469 JQ and pass close by the informal settlement Pikinien.

10.14 Environmental and current land use map

(Show all environmental, and current land use features)

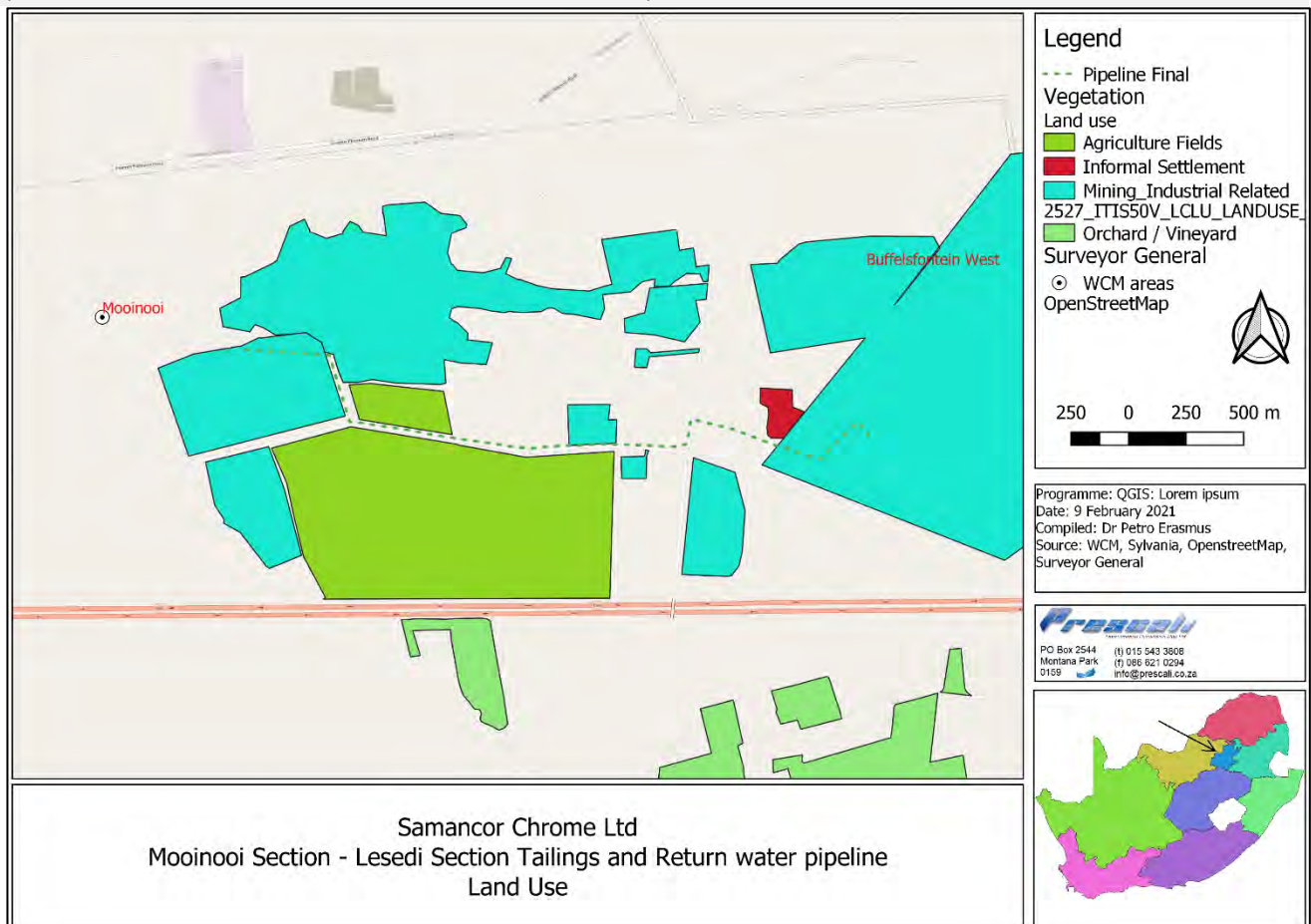


Figure 10-31: Land use/ Land Cover Map

11 IMPACTS AND RISKS IDENTIFIED

11.1 Methodology

11.1.1 Specialist Impact Identification and Assessment

The specialists specifically differentiated between the environmental impacts associated with the construction, operation and maintenance of the proposed pipeline. As far as possible, the specialists were required to quantify the suite of potential environmental impacts identified in their studies and assess the significance of the impacts. Each impact was assessed and rated. For the purposes of this Basic Assessment process, the term 'assessment' refers to "the process of collecting, organising, analysing, interpreting and communicating data relevant to some decisions". The assessment of the data was, where possible, based on accepted scientific techniques, failing which, the specialists made judgements based on their professional expertise and experience.



11.1.2 Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, 1998) and as amended from time to time (DEAT, 2002).

The level of detail as depicted in the EIA Guidelines (DEAT, 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 11-1: 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	
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.

11.1.3 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.

11.1.4 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 11-2: 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.

11.1.5 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 11-3: 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.

11.1.6 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.

11.1.7 Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer Table 11-4).

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 11-4: 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	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		



11.1.8 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:

$$\text{Significance Rating (WOM)} = (\text{Extent} + \text{Intensity} + \text{Duration} + \text{Probability}) \times \text{Weighting Factor}$$

11.1.9 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.

11.1.9.1 Mitigation Efficiency (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 11-4*).

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:

$$\text{Significance Rating (WM)} = \text{Significance Rating (WOM)} \times \text{Mitigation Efficiency}$$

or $\text{WM} = \text{WOM} \times \text{ME}$

11.1.10 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

12 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).

Table 12-1: Positive and Negative Impacts of the various options for the proposed pipeline

Alternative	Positive aspects	Negative impacts
Alt 1	Most of the pipeline is located within the road servitude.	Longer length of the pipeline is located within the 32 m buffer of a watercourse. Construction will result in negative impacts on ecology, surface water, and soils.
Alt2 and Alt 3	N/A	Construction will result in negative impacts similar to Alt1. These two options are longer and the areas are not as visible as Alt1 and Alt4/Final Route thus a higher potential of vandalism and theft is expected.
Alt4 or Final Route	Part of the pipeline is within the road reserve. The footprint area for both these options are within the 32 m buffer area of a watercourse though the impacted high sensitivity area is smaller than Alt1.	Construction will result in negative impacts on ecology, surface water and soils.



12.1 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).

The mitigation measures have addressed in the Section 4 under Environmental Management Programme (Part B). Issues raised by interested and affected parties are included in Section 9.1 of Part A.

12.2 Motivation where no alternative sites were considered.

Various alternatives with regards to the proposed route of the pipeline was assessed as were other options, please refer to Section 8.1.

12.3 Statement motivating the alternative development location within the overall site.

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

Pipeline Alt4 / Final Route is the preferred option and the main reason is the fact that both these options will result in less than an impact on nearby watercourses than Alt1. The final decision of which of these two option will be implemented will depend on the final agreements reached with the respective property owners.

12.4 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.)

In order to identify the potential impacts associated with the proposed pipelines, the following steps were undertaken:

- The stakeholder consultation process is currently undertaken in a manner to be interactive, providing landowners and identified stakeholders with the opportunity to provide input into the project. This is a key focus, as the local residence has capabilities of providing site specific information, which may not be available in desktop research material. Stakeholders are requested to provide their views on the project and any potential concerns which they may have. All comments and concerns are captured and formulated into the impact assessment.
- A detailed desktop investigation was undertaken to determine the environmental setting in which the project is located. Based on the desktop investigations various resources were used to determine the significance and sensitivity of the various environmental considerations. The desktop investigation involved the use of:
 - Detailed mapping based on existing data sources applicable to the proposed area;
 - Geographic Information System base maps;
 - Literature and existing data/reports for the study area;
- A site visit was conducted on the 06 August 2020. The site visit was to ensure that the information gathered as part of the Desktop investigation reflects the current status of the land.
- The ratings of the identified impacts were undertaken in a quantitative manner as provided in Impact Assessment Section. The ratings were undertaken in a manner to calculate the significance of each of the impacts. The EAP also assesses the outcomes of the calculation to determine whether the outcome reflects the perceived and the actual views.
- The identification of management measures is done based on the significance of the impacts and measures that have been considered appropriate and successful, specifically as best practical and economical options.



13 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).

Table 13-1: Assessment of identified potentially significant impact and risk (Magnitude: M; Duration: D; Extend: E; Weighing factor: WF; SR: Significance rating; ME: Mitigation efficiency)

Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR			
		<i>(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, Groundwater contamination, air pollution etc.....etc....)</i>	<i>Of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure.</i>										
Development of pipelines	Ecology: Flora Diversity	Impact on overall floral diversity: Development related activities will lead to destruction of moderately to heavily modified habitat 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.	C, O	3	4	2	5	3	42	Medium	0,8	33,6	Low to Medium
Development of pipelines	Ecology: Flora Diversity	Flora diversity due to exotic and invasive plant species: 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.	C, O	3	4	2	4	3	39	Low to medium	0,6	23,4	Low to Medium
Development of pipelines	Ecology: Flora Species of	Impact on floral species of conservation concern due to destruction of sensitive habitats: Development related activities	C, O	3	4	3	2	2	24	Low to medium	0,6	14,4	Low



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
	conservation concern	may lead to the loss of floral species of conservation concern. Fourteen (14) species listed for the area are classified as species of conservation concern and may potentially occur on the project footprint. However, no flora SCC were observed to occur on the project footprint and 200 m project buffer during the site survey. Development and related activities could impact on the sensitive habitats related to the watercourses situated on and around the project footprint.											
Closure / Post closure of pipelines	Ecology: Flora species	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	C, Post Cl	3	3	2	3	3	33	Low to medium	0,6	19,8	Low
Development of pipelines	Ecology: Fauna species	The initial clearance and construction activities might result in impacts on sensitive areas (such as river crossing impacts) or large-scale destruction and land clearance will be required including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is	C, O	5	4	3	5	4	68	Medium to High	0,8	54,4	Medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
		currently finding refuge will migrate to other more favourable areas.											
Development of pipelines	Ecology: Fauna species	Construction activities, constant movement on and around the terrain with heavy construction vehicles might result in compaction of the soil and destruction of other vegetation habitat which will impact on the animals that use the area as habitat. Storing of foreign materials, such as construction material, mixing of concrete or collection and delivering could result in pollution. The remaining natural areas will be severely impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area where the new TSF will be established and along the road where the pipeline is proposed.	C, O	3	4	3	5	4	60	Medium to High	0,8	48	Medium
Development of pipelines	Ecology: Fauna species	The drainage system where the river crossing will occur may be impacted due to construction activities which may result in the destruction or degradation of riparian habitat for sensitive species. Other operational issues related to the pipeline also include possible spillage and leakages of the slurry.	C, O	3	3	3	5	4	56	Medium	0,6	33,6	Low to Medium
Operation of pipelines	Ecology: Fauna species	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. From the field assessment, it seems that a number of indirect impacts have already impacted the surrounding terrain.	O	3	3	3	5	4	56	Medium	0,4	22,4	Low to medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
Decommissioning of pipelines	Ecology: Fauna species	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Programme (EMPr) and Final Rehabilitation programme compiled for the specific Mooinooi mining and Lesedi treat and reclamation areas.	Cl, Post Cl	1	3	3	2	3	27	Low to medium	0,8	21,6	Low to medium
Development and decommissioning of the pipeline	Groundwater quality	Impact on water quality as a result of hydrocarbon spills from machinery used in the construction.	C, Cl, Post Cl	1	1	1	3	3	18	Low	0,6	10,8	Low
Development of the pipeline	Groundwater quantity	Impact on the groundwater levels as a result of construction and operation	C, O, Cl, Post Cl	1	1	1	1	1	4	Low	0	0	Low
Operation of the Tailings and return water pipelines	Groundwater quality	Impact as a result of tailings spill or return water spills from the pipeline could impact on groundwater quality, especially near watercourses	O	5	2	2	4	4	52	Medium	0,6	31,2	Low to medium
Construction of the pipeline	Surface water	Vegetation removal 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.	C	4	3	3	5	3	45	Medium	0,4	18	Low
Construction of the pipeline	Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	C	4	3	3	5	3	45	Medium	0,4	18	Low
Construction of the pipeline	Surface water	The potential for hydrocarbon spills from machinery is a possibility.	C	4	3	3	5	3	45	Medium	0,4	18	Low
Pumping of tailings slurry	Surface water	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	O	4,75	5	3	9	4	87	High	0,6	52,2	Medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
		water quality impacts. This in turn could impact on the habitat and the biota.											
Pumping of Return water	Surface water	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. High velocity spills from the pipe could result in erosion of the bank of the watercourse which would add to siltation and result in negative impacts on the habitat, water quality and biota.	O	4,75	5	3	9	4	87	High	0,6	52,2	Medium
Removal of pipelines	Surface water	Hydrocarbon spills from machinery making use of the existing access road may impact on surface water quality.	Cl	4	3	3	5	3	45	Medium	0,4	18	Low
Removal of pipelines	Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	Cl	4	3	3	5	3	45	Medium	0,4	18	Low
All existing activities, opencast mining, underground mining, mineral beneficiation, offices, etc. in addition to proposed new infrastructures.	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	C	5	5	3	9	4	88	High	0,6	52,8	Medium
All existing activities, opencast mining,	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The	O	5	5	3	9	4	88	High	0,6	52,8	Medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
underground mining, mineral beneficiation, offices, etc. in addition to proposed new infrastructures.		watercourses are fragmented and continuity has been compromised.											
All existing activities, opencast mining, underground mining, mineral beneficiation, offices, etc. in addition to proposed new infrastructures.	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	CI, Post CI	5	5	3	8,5	4	86	High	0,6	51,6	Medium
Transport of materials and labour with trucks and buses	Soils: Erosion	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	C	3	5	2	4	4	56	Medium	0,4	22,4	Low to medium
Vehicle movement	Soils: Compaction	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project. The areas to be compacted where surface infrastructure will be constructed. Wet soil is more prone to compaction when	C	5	5	1	4	4	60	Medium to High	0,8	48	Medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
		there is heavy equipment and vehicles traversing over it.											
Vehicle movement	Soils pollution	During construction, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	C	5	3	1	3	4	48	Medium	0,2	9,6	Low
Topsoil removal	Disturbance of soil horizon organisation	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture. This reduces the fertility of the soil through the disturbance (and sometimes destruction) of the soil nutrient cycles as well as the hydrogeological functioning of the soil profiles.	C	5	5	1	5	4	64	Medium to High	0,8	51,2	Medium
Construction of pipelines	Change in land capability	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing/arable and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	C	5	5	1	5	4	64	Medium to High	0,8	51,2	Medium
The operational phase includes all the processes associated with the daily maintenance of	Soil erosion	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion	O	3	5	2	4	4	56	Medium	0,4	22,4	Low to medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
the proposed new infrastructure.													
Vehicle movement	Soil Compaction	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	O	5	5	1	4	4	60	Medium to High	0,8	48	Medium
Vehicle movement	Soil Pollution	During the operational phase of these infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.	O	5	3	1	3	4	48	Medium	0,2	9,6	Low
Demolition and removal of infrastructure	Soil erosion	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	Cl, Post Cl	3	5	2	4	4	56	Medium	0,4	22,4	Low to medium
Vehicle movement	Soil Compaction	The pipeline materials will be transported away from site in the decommissioning phase. Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	Cl, Post Cl	5	5	1	4	4	60	Medium to High	0,8	48	Medium
Vegetation establishment	Change in land capability	As decommissioning commences, pipeline will be removed from the surface and indigenous vegetation will be established where possible. This will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and	Cl, Post Cl	5	5	1	5	4	64	Medium to High	0,4	25,6	Low to medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation							ME	Significance after mitigation	
				M	D	E	P	WF	SR	SR		SR	
		successful. This may increase the land capability over time											
Construction of pipelines	Visual impact: Exposure rating	The construction of the proposed Mooinooi project with its associated infrastructure will increase the cumulative visual impact of mining type infrastructure within the region. In context of the mining and light agricultural activities, the construction phase of the Mooinooi structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable.	C	1	1	3	3	2	16	Low	0,8	12,8	Low
Construction of pipelines	Visual impact on users of roads and land users	Permanent visibility of the pipeline on users of the road and land users	O	4	1	3	3	2	22	Low to medium	0,4	8,8	Low
Construction of the pipelines	Socio-Economic impact	A brief positive impact on local income as more people will be employed during the construction and decommissioning phases of the pipeline	C, CI	1	1	2	5	3	27	Low to medium	0	0	Positive impact
Operation of the pipelines	Socio-Economic impact	The use of the pipeline will allow the continuation of the Lesedi tailings retreatment plant and ensure that current employment opportunities are maintained. An indirect effect of the continuation of the tailing retreatment is that the tenders issued by the tailing retreatment contractor is preferentially given to local small and medium enterprises which ensure a positive impact with regards to employment in the area.	O	5	5	3	5	5	90	High	0	0	Positive impact
Operation of the pipeline	Crime and safety	As the proposed pipeline will be located within the existing road reserve for as far as possible should deter thieves from damaging and vandalising the pipeline due to traffic in this area. The area of concern is the portion of the pipeline that will not be	O	5	5	2	4	5	80	High	0,4	32	Low to medium



Activity	Aspects affected	Potential Impact	Phase	Significance before mitigation						ME	Significance after mitigation		
				M	D	E	P	WF	SR		SR		
		as heavily traffic, this area may be prone to vandalism and theft and this could have an impact on the socio economic situation of the area as well as the safety of the local residents and security personnel in the area.											
Construction, operation and decommissioning of the pipelines	Heritage / archaeological	None, no sites identified	C, O, Cl, Post Cl										
Construction, operation and decommissioning of the pipelines	Geology	None, limited impact only on footprint area and most of the pipeline will be on surface	C, O, Cl, Post Cl										
Construction, operation and decommissioning of the pipelines	Topography	None, limited impact only on footprint area and most of the pipeline will be on surface	C, O, Cl, Post Cl										



14 SPECIALIST STUDIES

The following Specialist studies were conducted:

- Pipeline and boosting stations designs (See Appendix 6.6 and Appendix 6.7)
- Surface Water Impact Assessment (See Appendix 6. 1: Surface Water Impact Assessment);
- Soil and Land Capability Assessment (See Appendix 6.2: Soil and Land Capability Impact Assessment);
- Ecological Impact Assessment (See Appendix 6. 3: Ecological Impact Assessment);
- Heritage Impact Assessment (See Appendix 6. 4: Heritage Impact Assessment); and
- Visual Impact Assessment (See Appendix 6. 5: Visual Impact Assessment).

14.1 Specialist scope and objectives

14.1.1 Surface Water

The scope and purpose of the surface water assessment is:

- To provide a description of the surface water environment in and around the proposed pipeline area; and
- To determine potential impacts on the surface water resource as a result of the proposed activities.

14.1.2 Ecological Assessment

The Flora and Fauna Assessment consisted of the following:

- A desktop vegetation study, which included:
 - Classification of the main biome and description of the dominant vegetation type;
 - Investigation of the dominant indigenous species within this region;
 - Listing the endemic species;
 - Listing species of conservation concern; and
 - Determining the medicinal species.
- A desktop invertebrate and mammal study, which included determining the:
 - Endemic species;
 - Baseline occurrences of species within the area;
 - Virtual Museum and Animal Demographic Unit consultation; and
 - Listing species of conservation concern.

The following provincial and national legislation and best-practice documents are relevant to this study:

- National Environmental Management Protected Areas Act, 2003 (Act No. 57 of 2003);
- National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004);
- National Protected Area Expansion Strategy;
- National Biodiversity Assessment (2011 & 2018);
- National Freshwater Ecosystems Priority Atlas;
- National Forests Act, 1998 (Act No. 84 of 1998); and
- The North West Biodiversity Management Act, 2016 (Act No. 4 of 2016).

A field assessment was conducted to verify or dispute the findings as obtained during the desktop assessment.

The following information resources were consulted in order to ascertain whether any species of conservation concern occur, or could possibly occur within the study area:

- CITES;
- POSA;
- IUCN Red Data List;
- SANBI Virtual Museum Data;
- Mammal Red list of South Africa (2016);
- Eskom Red listed birds (BLSA Checklist 2018 & 2019); and
- ToPS List.

14.1.3 Heritage Impact Assessment

The Terms of Reference was to:



- Identify all objects, sites, occurrences and structures of an archaeological or historical nature (cultural heritage sites) located on the portion of land that will be impacted upon by the proposed development;
- Assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value;
- Describe the possible impact of the proposed development on these cultural remains, according to a standard set of conventions;
- Propose suitable mitigation measures to minimize possible negative impacts on the cultural resources; and
- Review applicable legislative requirements.

14.1.4 Visual Impact Assessment

The scope of work for this Visual Impact Assessment will include:

- a) Describe the existing visual characteristics of the proposed sites and its environs;
- b) Viewshed and viewing distance using GIS analysis up to 15 km from the proposed structures; and
- c) Visual Exposure Analysis comprising the following aspects:
 - Terrain Slope: Slope angle is determined from the Digital Terrain Model (DTM) and the location of the proposed structures given a ranking depending on the steepness of the slope.
 - Aspect of structure location: Aspect of the slope where the structures are to be built, are calculated from the DTM and given a ranking determined by the Sun angle.
 - Landforms: Landform of the location of the proposed structures are determined from the DTM and ranked according to the type of landform. Structures built on certain landforms, e.g. ridges, will be more visible than structures built in valleys.
 - Slope Position of structure: Using GIS analysis, the position of the proposed structure is determined and ranked according to the position on the slope the structure is to be built.
 - Relative elevation of structure: Using the DEM, the elevation of the proposed structure relative to the surrounding elevation is determined and ranked according to the difference in height of the surrounding areas.
 - Terrain Ruggedness: The terrain ruggedness is determined from the DEM and given a ranking based on the homogeneousness of the terrain.
 - Viewer Sensitivity: The Viewer sensitivity ranking of the surrounding areas is determined using various land cover and land use datasets and ranked according to the sensitivity of the related structures to the environment.
 - Overall Visual Impact: Combining all the above dataset a final visual impact of the proposed structures is calculated.

14.1.5 Soil and land capability

In order to meet the Terms of Reference, the following Scope of Works were applied for the assessment:

- Undertake a desktop study and site investigation to establish broad baseline soil conditions (from land type data), land capability and areas of environmental sensitivity at all the proposed alternative sites in order to rate their sensitivity to the proposed development.
- Undertake a soil survey of the areas that have been provided by the client.
- Describe soils in terms of soil form, texture, soil structure, effective depth, structure, soil colour and presence of carbonates.
- Classify and describe soils using the South African Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018).
- Classify the land capabilities following the most suitable land capability classification system.
- Determine the agricultural potential of the site following the site survey as well as taking climatic considerations into account.
- Determine the agricultural income and employment opportunities associated with the current land uses.
- Identify and assess the potential impacts that the proposed project will have on soil and agricultural potential of the area.
- Recommend mitigation, management and monitoring measures to minimise impacts and/or optimise benefits associated with the proposed project.



- Indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.

14.2 Assumptions and Limitations

14.2.1 Surface Water Impact Assessment

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. All opinions and comments are based on available resources and data at the time and findings during the site assessment may either verify or dispute the findings within this report.

A field assessment has been conducted based on selected representative biomonitoring points for future sampling and although dry during the time of assessment, these sites could be utilized for long term monitoring. Viability should be confirmed during the wet season.

14.2.1.1 Riparian vegetation

In order to obtain a comprehensive understanding of the dynamics of the 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.

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.

One-site verification was undertaken during the winter months (August). Climatic and site conditions were not optimal for the floral site survey to be undertaken. However, the general condition and species composition of the sites could be established.

The wetland indicator status assigned to each of the species identified within the riparian zones surveyed should be viewed with the following limiting factors in mind. Although these categories are used to describe typical habitats of species, their use as a proxy of habitat may have limitations due to inaccuracy in classifying some species, and because they may not adequately represent all aspects of habitat, such as disturbances. The assignment of categories to species is often subjective and based on best professional judgment of the specialist.

14.2.1.2 Biomonitoring

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. All opinions and comments are based on available resources and data at the time and findings during the site assessment may either verify or dispute the findings within this report. A field assessment has been conducted based on selected representative biomonitoring points for future sampling and although dry during the time of assessment, these sites could be utilized for long term monitoring. Viability should be confirmed during the wet season

14.2.1.3 Overall assessment

This report and the assessment are based on available information as provided by Samancor Chrome Ltd – Western Chrome Mines and as outlined in Section 2.1 and throughout Section 5.

14.2.2 Ecological Impact Assessment

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. Usually, due to project time constraints such long-term studies are not feasible and this fauna and flora survey was conducted predominantly in one season.

A site survey was undertaken on the 5th of August 2020 and the growing season had not yet commenced. This should therefore be seen as a limitation to the study; however, the areas were found to be impacted and the confidence of the study is considered to be sufficient for the intended purposes. The general condition and species composition of the site could be established.

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 and may have been missed entirely.

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.

14.2.3 Heritage Impact Assessment

No Assumptions were made for the Heritage Impact Assessment.

14.2.4 Visual Impact Assessment

14.2.4.1 Assumption

- The core study area can be defined as an area with a radius of not more than 10 km from the structures and a total study area with a radius of 15 km from the structures. This is because the visual impact of structures beyond a distance of 10 km would be so reduced that it can be considered negligible even if there is direct line of sight.
- It is assumed that there are no alternative locations for the structures and that the visual assessment, therefore, assessed only the proposed site.
- The height of the VIA is based on the heights provided.
- Geographic location within the mining boundary of infrastructure.
- The assessment was undertaken during the planning stage of the project and is based on the information available at that time.
- Visual perception is by nature a subjective experience, as it is influenced largely by personal values. For instance, what one-viewer experiences as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. In order to limit such subjectivity, a combination of quantitative and qualitative assessment methods was used. A high degree of reliance has been placed on GIS-based analysis viewshed, visibility analysis, and on making transparent assumptions and value judgements, where such assumptions or judgements are necessary.
- The viewshed generated in GIS cannot be guaranteed as 100% accurate. Some viewpoints, which are indicated on the viewshed as being inside of the viewshed, can be outside of the viewshed. This is due to the change of the natural environment by surrounding activities as well as natural vegetation that play a significant role and can have a positive or negative influence on the viewshed.

14.2.5 Soil and Land capability Impact Assessment

The following assumptions were made during the assessment and reporting phases:

- The assessment of the anticipated impacts assumes that the proposed surface footprint of the project will stay within the confines as depicted in the layout maps in this report.



- It was assumed that the layout will consist of the components stipulated in the final project layout and description that was provided by the applicant.
- Assumptions regarding the impacts of the proposed infrastructure were made and based on the author's knowledge of the nature and extent of the planned infrastructure.
- Soil texture was determined using in-field techniques where a handful of soil is wetted with water and then shaped into a soil ribbon. The behaviour of the soil during formation of the ribbon, is used as a guideline for determination of the soil texture.

14.3 Monitoring and Management Programmes

14.3.1 Surface Water

The following monitoring plan is proposed for surface water.

Table 14-1: Surface water monitoring programme

Location	Aspect	Parameters	Frequency
At pipeline watercourse crossings	Vegetation establishment and alien invasive plant determination	Vegetation cover and vegetation species. Photographic records.	Annually

14.3.2 Ecological Impact Assessment

An ECO or appropriately appointed person must ensure that all impacts remain within the approved footprint and remains in compliance with the approved EMPr.

Monitoring of the terrestrial ecology should be done on an annual basis to assess whether there are any concerns regarding the flora. Monitoring of the flora should start as soon as the construction phase of the development commences. The monitoring should include the following:

- Annual visual assessment of surrounding areas to determine if vegetation in undisturbed areas is being impacted. The visual assessment can be undertaken by the ECO. Photographic record of monitoring sites should be kept for comparison between monitoring events.
- Annual alien invasive plant monitoring, eradication and control programme.
- 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.
- Monitor the ecological characteristics, rehabilitation and recovery after Decommissioning until it is self-sustaining and a closure certificate is obtained.

14.3.3 Heritage Impact Assessment

No monitoring requirements for the Heritage Impact Assessment.

14.3.4 Visual Impact Assessment

No Monitoring requirements for the Visual impact assessment.

14.3.5 Soil and Land Capability Impact Assessment

Routine monitoring around the development site for soil contamination as a result of vehicles and spillage of the tailings material when needed.

14.4 Findings, Recommendations and Conclusions

14.4.1 Surface Water Impact Assessment

The results of a single sampling event should always be interpreted with caution and may not represent the overall conditions normally experienced. Since no flow was present within the area surveyed, but the study coincided with the low flow or dry season, follow-up studies during the wet season are recommended to establish the long-term feasibility of aquatic ecology assessments and biomonitoring to establish the baseline environment and temporal trends within these tributaries.



If found to be feasible, follow-up SASS studies should be conducted bi-annually to compare results and continue with establishment of long-term trends.

Based on available data for the Maretlwana Sub-Reach, the PES based on aquatic ecology assessments (current PES of reach) should be aligned with Class D with the REC given as Class C as per IUAs. Based on the field assessment results, the condition of these sites is visibly impacted.

14.4.2 Ecological Impact Assessment

According to the National Vegetation Map (2018) the project site falls within the Marikana Thornveld (SVcb6) vegetation type. Plant species previously recorded for the region was extracted from the POSA online database hosted by SANBI. The results indicate that approximately 888 plant species occur within the area queried. Fifty-seven (57) endemic species were found to possibly occur in the area. Thirty-four (34) exotic species are known to occur within the area queried. Fourteen (14) plant species listed 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 NWBMA.

Only mammalian and avifaunal species with a red listed status are known to occur within the specific area where the development is proposed.

Common name	Species	Conservation status
Mammalian species		
Southern African Hedgehog	<i>Atelerix frontalis</i>	Near Threatened (2016)
Avifaunal species		
Falcon, Lanner	<i>Falco biarmicus</i>	VU (Regional), LC (Global)
Falcon, Red-footed	<i>Falco vespertinus</i>	NT (Regional), NT (Global)
Sandgrouse, Yellow-throated	<i>Pterocles gutturalis</i>	NT (Regional), LC (Global)
Sandpiper, Curlew	<i>Calidris ferruginea</i>	LC (Regional), NT (Global)
Stork, Abdim's	<i>Ciconia abdimii</i>	NT (Regional), LC (Global)

Many other species were listed provincially and are not included within the summary above, but have been incorporated below.

Thirty-three (33) mammal species were found to possibly occur within the QDS. Three (3) have been included within the National Red Data List and twenty-one (21) other species have been listed provincially.

Two hundred and twenty-nine (229) bird species were recorded for this area. Five (5) avifaunal SCC (National or International Importance) have been indicated for the relevant pentads, and a total of seventeen (17) species have been listed in Provincial legislation.

Eighty-seven (87) butterfly species were recorded for the QDS, all of which are categorized as Least Concern. One (1) species of Dung beetle, five (5) species of Odonata and one (1) species of Scorpion were recorded for the QDS, all of which has a Least Concern rating. However, in terms of Provincial legislation, five (5) butterfly species and all Dung beetle species are listed under Schedule 2 of the NWBA.

Twelve (12) reptiles were recorded for the QDS, all with a LC status, however, three (3) reptilian species were listed Provincially. Fifteen (15) amphibian species were recorded for the QDS, all with a LC status and none listed provincially.

The site assessment for the development was conducted on the 5th of August 2020.

Vegetation units were identified according to plant species composition, and previous and current land use. The state of the vegetation of the proposed expansion activities varies from being moderately modified natural vegetation to completely transformed. The following broad classification of Vegetation Units (VU) was found to occur on the proposed project footprint:



- Thornveld (VU1); The thornveld vegetation unit (VU1) was rated as having a Moderate sensitivity, based on the moderately to heavily disturbed condition of the vegetation and the absence of SCC observed. Consideration was given to the Vulnerable conservation status of the Marikana Thornveld and the biodiversity category given by the NWBSP.
- Drainage lines (VU2): 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. The riparian areas or drainage lines on site are denoted as having High sensitivity.
- Transformed areas (VU3) are totally disturbed and cannot be considered sensitive. Therefore, a low sensitivity was assigned to this vegetation unit.

Of the 41 plant species identified during the site assessment, six species not indigenous to South Africa were identified of which two are listed as alien and invasive plant (AIP) species in NEMBA. Ten species that were found to occur on site have medicinal uses. No floral SCC was identified to occur on the project footprint or 200 m buffer.

The faunal species sighted mostly occurred in the natural areas at the TSF development site next to the proposed pipeline footprint, but diversity and abundance were clearly impacted showing a limited community structure, similar to an almost urban setting due to the large-scale mining, informal communities and other anthropogenic impacts already present. No faunal SCC was observed during the field assessment.

According to the National Vegetation Map (2018) the project site falls within the Marikana Thornveld (SVcb6) vegetation type. This ecosystem is listed in the National List of Threatened Ecosystems as Vulnerable.

According to the North West Conservation Plan the project footprints falls within areas categorised as CBA2, ESA1 and ESA2.

The proposed expansion activity footprint and existing mines are located within the Transition Zone of the Magaliesberg Biosphere Reserve (MBR), which is also an Important Birding Area (2015). The Magaliesberg Protected Natural Environment, which is a Protected Area in terms of the NEMPAA, is located approximately 5 km to the south of the project footprint.

Impacts were rated as Medium/Low and mitigated to Low with the implementation of mitigation measures. It is the opinion of the specialists that the development may continue without severe ecological impacts (specifically since the area has already been subjected to many alterations and impacts) in terms of the faunal and floral species identified in the framework of the study. Management of impacts should be initiated from the onset of the project.

14.4.3 Heritage Impact Assessment

The Phase 1 AIA indicated that there are a number of cultural heritage (archaeological & historical) sites and features in the larger geographical area, although nothing is known for the specific parcel of land. The physical assessment work was undertaken during July 2020.

No sites, features or material of any archaeological heritage (and/or historical) origin or significance was identified in the study area. The area has been fairly extensively disturbed in the recent historical past by agricultural activities such as ploughing/crop growing and cattle grazing, while recent mining-related activities has also impacted. This includes roads, electrical powerlines and servitudes. The area is also characterized by turf soils and large-scale settlement during the Iron Age would not have been favoured here. LIA settlements would have been located closer to and on the surrounding ridges and hills.

It should be noted that although all efforts are 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.



Finally, from an Archaeological point of view, the development should be allowed to continue, taking the above measurements into consideration.

14.4.4 Visual Impact Assessment

The construction and operation phase of the proposed Mooinooi project related activities and its associated infrastructure will have a LOW-MEDIUM visual impact on the natural scenic resources and topography. However, with the correct mitigation measures the impact might decrease to a point where the visual impact can be seen as less significant. The moderating factors of the visual impact of the proposed mining operations in close range are the following:

- Number of human inhabitants located in the area;
- Natural topography and vegetation;
- Mitigation measures that will be implemented such as the establishment of barriers or screens;
- The size of the operation;
- High absorption capacity of the landscape; and
- Expansion of a current mining operation.

In light of the above-mentioned factors that reduce the impact of the facility, the visual impact is assessed as LOW VISUAL IMPACT after mitigation measures have been implemented.

The Visual Impact due to mining activities and associated infrastructure can be seen as having a LOW-MEDIUM impact on the surrounding environment and inhabitants before mitigation measures are implemented. After mitigation, the visual impact can be seen as LOW. The visual impact from the mining activities can be sufficiently mitigated to a point where it can be seen as insignificant. Thus, mitigation measures are very important and one of the most significant mitigation measures are the rehabilitation of the area after mining has been concluded. If the rehabilitation of the impact is not done correctly and the final landform do not fit into the surrounding area then the visual impact will remain high and become a concern. However, with correct rehabilitation, the impact will be minimal and might even increase the aesthetics of the operational area, since it is a previously mined area, after the landform has been restored.

14.4.5 Soil and Land Capability Assessment

The proposed infrastructure expansion at the Samancor WCM Mooinooi Section, falls within a larger area where chrome mining activities have significantly increased over the past fifteen years. The current agricultural production of the areas that were assessed for the proposed development, consist of rainfed crop production of summer crops such as maize. No evidence of irrigated crop production within the study area was found. Although no livestock was seen grazing in the area during the site visit, the area may be part of a larger agricultural unit and may be used sometimes for this purpose. Taken the existing impacts into consideration, the entire study area may provide feed for 3 to 4 head of cattle when following the long-term grazing capacity of 10 ha/LSU for the area.

From the perspective of soil conservation and sustainable land use, the project will have a negative impact wherever the activities result in surface disturbance, cause soil contamination and exclude livestock grazing from the areas currently suitable for grazing. It is anticipated that these impacts will either have medium-to-high or medium risk that can be mitigated to medium and low risk, depending on the nature of the impact. It is also anticipated that removal of any boundary fences during the decommissioning phase, will have a medium positive impact on returning some land to the community for livestock grazing.

It is assumed that the proposed project infrastructure design will include several precautionary measures to reduce the impacts such as a stormwater diversion trench to divert clean water away from possibly contaminated area. Other mitigation measures that must be included are the limitation of the project footprint to as small as possible as well the continual monitoring of any soil contamination sources such as vehicles and equipment and the spillage of the solid waste in the project area.



The proposed pipelines will be constructed within the existing road servitude and will not impact on the crop production in the surrounding crop fields. The pipelines will be constructed above-ground and will be removed again during the decommissioning phase.

The area where the proposed pipelines will be constructed, has Low Agricultural Sensitivity. Considering all of the above, the authorisation of the proposed infrastructure components will be an acceptable land use change in the area.

15 ENVIRONMENTAL IMPACT STATEMENT

15.1.1 Summary of the key findings of the environmental impact assessment

Table 15-1: Summary of key findings of the environmental impact assessment (With Mitigations, C: Construction, O: Operational, CI: Closure)

Aspects affected	Potential Impact	Phase	Significance after mitigation	
Ecology: Flora Diversity	Impact on overall floral diversity: Development related activities will lead to destruction of moderately to heavily modified habitat 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.	C, O	33,6	Low to Medium
Ecology: Flora Diversity	Flora diversity due to exotic and invasive plant species: 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.	C, O	23,4	Low to Medium
Ecology: Flora Species of conservation concern	Impact on floral species of conservation concern due to destruction of sensitive habitats: Development related activities may lead to the loss of floral species of conservation concern. Fourteen (14) species listed for the area are classified as species of conservation concern and may potentially occur on the project footprint. However, no flora SCC were observed to occur on the project footprint and 200 m project buffer during the site survey. Development and related activities could impact on the sensitive habitats related to the watercourses situated on and around the project footprint.	C, O	14,4	Low
Ecology: Flora species	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	C, Post CI	19,8	Low
Ecology: Fauna species	The initial clearance and construction activities might result in impacts on sensitive areas (such as river crossing impacts) or large-scale destruction and land clearance will be required including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.	C, O	54,4	Medium
Ecology: Fauna species	Construction activities, constant movement on and around the terrain with heavy construction vehicles might result in compaction of the soil and destruction of other vegetation	C, O	48	Medium



Aspects affected	Potential Impact	Phase	Significance after mitigation	
	habitat which will impact on the animals that use the area as habitat. Storing of foreign materials, such as construction material, mixing of concrete or collection and delivering could result in pollution. The remaining natural areas will be severely impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area where the new TSF will be established and along the road where the pipeline is proposed.			
Ecology: Fauna species	The drainage system where the river crossing will occur may be impacted due to construction activities which may result in the destruction or degradation of riparian habitat for sensitive species. Other operational issues related to the pipeline also include possible spillage and leakages of the slurry.	C, O	33,6	Low to Medium
Ecology: Fauna species	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. From the field assessment, it seems that a number of indirect impacts have already impacted the surrounding terrain.	O	22,4	Low to medium
Ecology: Fauna species	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Programme (EMPr) and Final Rehabilitation programme compiled for the specific Mooinooi mining and Lesedi treat and reclamation areas.	Cl, Post Cl	21,6	Low to medium
Groundwater quality	Impact on water quality as a result of hydrocarbon spills from machinery used in the construction.	C, Cl, Post Cl	10,8	Low
Groundwater quantity	Impact on the groundwater levels as a result of construction and operation	C, O, Cl, Post Cl	0	Low
Groundwater quality	Impact as a result of tailings spill or return water spills from the pipeline could impact on groundwater quality, especially near watercourses	O	31,2	Low to medium
Surface water	Vegetation removal 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.	C	18	Low
Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	C	18	Low
Surface water	The potential for hydrocarbon spills from machinery is a possibility.	C	18	Low
Surface water	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.	O	52,2	Medium
Surface water	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. High velocity spills from the pipe could result in erosion of the bank of the watercourse which would add to siltation and result in negative impacts on the habitat, water quality and biota.	O	52,2	Medium
Surface water	Hydrocarbon spills from machinery making use of the existing access road may impact on surface water quality.	Cl	18	Low
Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative	Cl	18	Low



Aspects affected	Potential Impact	Phase	Significance after mitigation	
	impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.			
Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	C	52,8	Medium
Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	O	52,8	Medium
Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	Cl, Post Cl	51,6	Medium
Soils: Erosion	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	C	22,4	Low to medium
Soils: Compaction	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project. The areas to be compacted where surface infrastructure will be constructed. Wet soil is more prone to compaction when there is heavy equipment and vehicles traversing over it.	C	48	Medium
Soils pollution	During construction, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	C	9,6	Low
Disturbance of soil horizon organisation	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture. This reduces the fertility of the soil through the disturbance (and sometimes destruction) of the soil nutrient cycles as well as the hydropedological functioning of the soil profiles.	C	51,2	Medium
Change in land capability	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing/arable and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	C	51,2	Medium
Soil erosion	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion	O	22,4	Low to medium
Soil Compaction	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	O	48	Medium
Soil Pollution	During the operational phase of these infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid	O	9,6	Low



Aspects affected	Potential Impact	Phase	Significance after mitigation	
	soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.			
Soil erosion	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	CI, Post CI	22,4	Low to medium
Soil Compaction	The pipeline materials will be transported away from site in the decommissioning phase. Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	CI, Post CI	48	Medium
Change in land capability	As decommissioning commences, pipeline will be removed from the surface and indigenous vegetation will be established where possible. This will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time	CI, Post CI	25,6	Low to medium
Visual impact: Exposure rating	The construction of the proposed Mooinooi project with its associated infrastructure will increase the cumulative visual impact of mining type infrastructure within the region. In context of the mining and light agricultural activities, the construction phase of the Mooinooi structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable.	C	12,8	Low
Visual impact on users of roads and land users	Permanent visibility of the pipeline on users of the road and land users	O	8,8	Low
Socio-Economic impact	A brief positive impact on local income as more people will be employed during the construction and decommissioning phases of the pipeline	C, CI	Positive impact	
Socio-Economic impact	The use of the pipeline will allow the continuation of the Lesedi tailings retreatment plant and ensure that current employment opportunities are maintained. An indirect effect of the continuation of the tailing retreatment is that the tenders issued by the tailing retreatment contractor is preferentially given to local small and medium enterprises which ensure a positive impact with regards to employment in the area.	O	Positive impact	
Crime and safety	As the proposed pipeline will be located within the existing road reserve for as far as possible should deter thieves from damaging and vandalising the pipeline due to traffic in this area. The area of concern is the portion of the pipeline that will not be as heavily traffic, this area may be prone to vandalism and theft and this could have an impact on the socio economic situation of the area as well as the safety of the local residents and security personnel in the area.	O	32	Low to medium
Heritage / archaeological	None, no sites identified	C, O, CI, Post CI		
Geology	None, limited impact only on footprint area and most of the pipeline will be on surface	C, O, CI, Post CI		
Topography	None, limited impact only on footprint area and most of the pipeline will be on surface	C, O, CI, Post CI		

15.1.2 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: Layout Plans.

Please refer to Figure below and Figure 10-13.

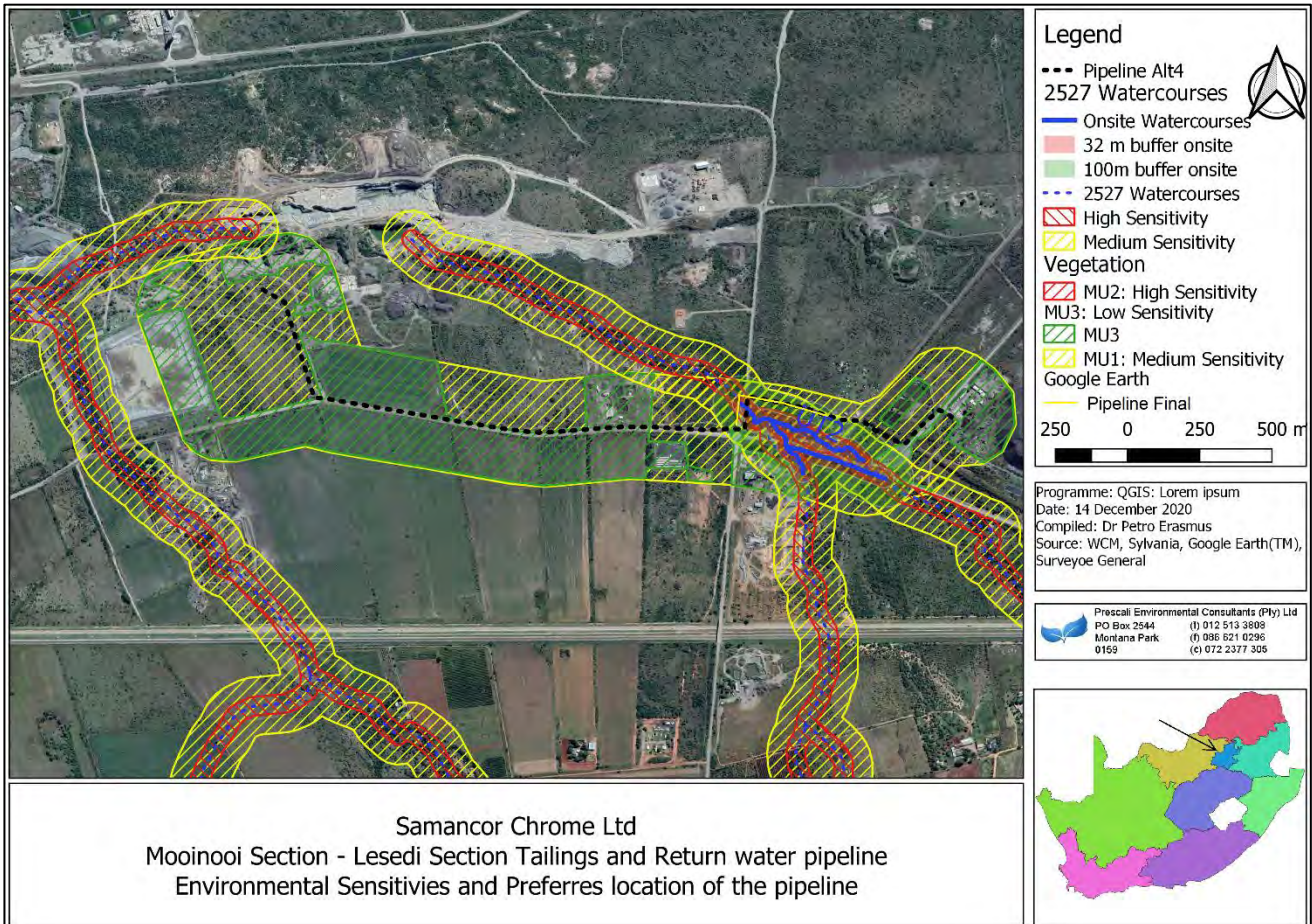


Figure 15-1: Final Sensitivities map

16 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.

Impact management objectives are developed to ensure that adverse socio-economic impacts and minimised and socio-economic benefits are maximised. Measures are further be defined to avoid, prevent, limit or manage any impacts.

The objectives of the EMPr will be to:

- Provide sufficient information and guidance to plan the pipeline construction and operational activities in a manner that would reduce both social and environmental impacts as far as possible.
- Provide sufficient information to strategically plan the pipeline construction and operational activities to avoid unnecessary social and environmental impacts.
- Provide a management plan that is effective and practical for implementation.
- Ensure an approach that will provide the necessary confidence in terms of environmental compliance.

Through the implementation of the mitigation and management measures it is expected that:

- Concerns regarding access control to farms can be managed through the development of an appropriate access control procedure and the compliance to the procedure.
- Risks associated with crime can be mitigated through the avoidance of recruitment activities on site and also monitoring and reporting.
- The water and soil resource pollution can be effectively managed through containment. Water resource availability can be managed through groundwater monitoring strategies.



- Ecological impact can be managed through the implementation of pollution prevention measures, land clearance minimisation, faunal disturbance by restricting working hours and rehabilitation.
- Visual impact can be minimised through the consideration of the material used for temporary infrastructure.
- Early consultation with the landowners and maintaining an open channel of communication must be ensured.

17 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION.

Any aspects which must be made conditions of the Environmental Authorisation

Annual monitoring of alien invasive plant species along the footprint of the pipeline should be conducted and alien invasive plant species should be removed on an annual basis.

The option to bury the pipeline for a portion from the Lesedi plant up to where it enters the road reserve should be investigated. This part of the pipeline includes the river crossing.

The length of the footprint of the pipeline should be investigated on a daily basis at random intervals.

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

(Which relate to the assessment and mitigation measures proposed)

Assumptions, limitations and gaps in knowledge are discussed in the specialist reports contained in Appendix 6 and Section 14.2.

The level of project detail presented in this report is sufficient to ensure a realistic identification of potential impacts. In assessing the potential significance of those impacts, the precautionary principle was implemented and a worst-case scenario assessed in each instance.

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

19.1 Reasons why the activity should be authorized or not

It is the opinion of the EAP that the proposed pipeline should be authorised to allow for the continued operations Tailings retreatment plant at Lesedi Section. The existing TSF at Lesedi Section is reaching its design capacity thus the need for another location for Tailings deposition has been identified. Due to the security issues at the "Phoenix" TSF site the Mooinooi TSF is the preferred option.

19.2 Conditions that must be included in the authorisation

- All mitigation measures as outlined in this report must be adhered to.
- Refer to Part A, Section 17 above.

20 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED.

The Construction of the pipeline will require 12 months and the operation of the pipeline will be unlimited until closure is needed.

21 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.

The undertaking required to meet requirements of this section is provided at the end of the EMPr (Part B, Section 13) and is applicable to both the Basic Assessment report and the Environmental Management report.

22 FINANCIAL PROVISION

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



The liability for the proposed pipeline is outlined below, the costing was based on the latest closure costing report provided by Sylvania (Appendix 8).

Removal of pipes	Length of pipeline (m)	Demolition rate for Pipes	Salvage value	Net cost for removal	Total
Pipelines (Return water)	3230	R1 224,00	-R2 312,83	R10 000,00	-R3 969 062,83
Pipelines (Tailings)	3230	R1 224,00	-R2 312,83	R10 000,00	-R3 969 062,83
Sub Total (Excl. VAT)					-R7 938 125,66
Topsoiling and Rehabilitation of vegetation	Area (m ²)	Rate			
Topsoiling	3230	R20,65			R66 699,50
Seeding 1st application	3230	R16,04			R51 809,20
Seeding 2nd Application	3230	R4,32			R13 953,60
Sub Total (Excl. VAT)					R132 462,30
Total					-R 7 805 663,36

22.1 Explain how the aforesaid amount was derived.

Refer to Part A, Section 22 as well as Table above.

22.2 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).

This amount can be provided from the operating expenditure.

23 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

23.1 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 (Act 107 of 1998). The EIA report must include the: -

23.1.1 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 an Appendix.

For the areas where the proposed pipeline will be located within the road servitude, none of the landowners, lawful occupiers or potential beneficiaries of land claims will be impacted. With regards to portion 35 of the farm Buffelsfontein 465 JQ the Land claim made in 2007 was made repealed in 2018 and it was amended and does not include portion 35 (Appendix 8). Should the pipeline be located on the surface this could impact on the land use with regards to grazing of animals. Though it is thus recommended that the pipeline on this portion be buried to prevent any impacts on grazers operational maintenance of the pipeline require that it be placed on surface.

23.1.2 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 in 2.5.3;).*



None expected, a heritage report is submitted as an appendix to this report (Appendix 6).

24 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).

A number of alternatives with regards to location of the new activities were investigated and included in Part A, Section 8.1 – no motivation is required in terms of sub-regulation 22(2) h.



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 details of the EAP are provided in section 1.1 of part A of this document.

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, section (1)(h) herein as required).

The requirement to describe the aspects of the activity that are covered by the final environmental management programme is included in PART A, Section 4.

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)*

Refer to Figure 15-1 and 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)

The following rehabilitation and closure objectives will be applicable for the effective and efficient long-term management of residual impacts:

- Create a long-term ecologically stable and self-sustaining system;
- Minimise the disturbance of any ecological sensitive system in the short-term;
- Meet with prevailing environmental legal requirements; and
- Prevent / minimise negative impacts as identified in this report.

This process allows the project management team to identify significant environmental features that should be addressed as a priority during the future operational, decommissioning and post closure phases of the project.

The process will also take into account the cost and time of undertaking such analysis and the availability of reliable data. The process to identify significant environmental aspects associated with the project activities shall, where relevant consider the following:

- Releases to Water;
- Waste Management;
- Contamination of Land;
- Use of Raw Materials and Natural Resources;
- Local Environmental and Community Issues; and
- Visual Impact Control.



Mooinooi Section undertakes to continually develop and implement procedures that will ensure that all the project activities are thoroughly addressed to make sure that project defined objectives are met. Specific project plans shall be available that identify and plan activities needed to achieve project objectives.

4.2 Volumes and rate of water use required for the operation

No additional volume of water will be required and the current water use licence volumes will not be exceeded.

4.3 Was a water use licence has been applied for?

The application process for a separate water use licence for Section 21(c) and (i) activities as a result of the crossing of the Buffelsfonteinspruit was submitted to the DWS and the link was approved on 5 February 2021 Reference number WU19199.



5 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

Measures to rehabilitate the environment affected by the undertaking of any listed activity.

Table 5-1: Mitigation Measures (C: Construction, O: Operation, CL: Closure)

Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
Development of pipelines	3 230 m ²	Ecology: Flora Diversity	Impact on overall floral diversity: Development related activities will lead to destruction of moderately to heavily modified habitat 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.	C, O	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.
					The operational area should be fenced in in order to reduce human and vehicle traffic to areas outside of the demarcated mining area.
					The vegetation removal during the construction phase should be controlled and very specific.
					Continuous rehabilitation of impacted areas (including the pipeline route) should occur during construction, where re-vegetation practices should be prioritised.
Development of pipelines	3 230 m ²	Ecology: Flora Diversity	Flora diversity due to exotic and invasive plant species: 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.	C, O	A management plan for the control of invasive and exotic plant species needs to be implemented for the project footprint and surrounding areas. 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.
Development of pipelines	3 230 m ²	Ecology: Flora Species of conservational concern	Impact on floral species of conservation concern due to destruction of sensitive habitats: Development related activities may lead to the loss of floral	C, O	All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas.
					If any SCC are encountered within the subject property in the future, the following should be ensured:



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			species of conservation concern. Fourteen (14) species listed for the area are classified as species of conservation concern and may potentially occur on the project footprint. However, no flora SCC were observed to occur on the project footprint and 200 m project buffer during the site survey. Development and related activities could impact on the sensitive habitats related to the watercourses situated on and around the project footprint.		<ul style="list-style-type: none"> • 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. • All rescue and relocation plans should be overseen by a suitably qualified specialist. • Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed. <p>Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.</p>
Closure / Post closure of pipelines	3 230 m ²	Ecology: Flora species	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	C, Post Cl	<p>A management plan for control of invasive/exotic plant species needs to be implemented for all footprint and surrounding areas. This will be ongoing until the end of the mining closure phase.</p> <p>Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase.</p> <p>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.</p> <p>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.</p>
Development of pipelines	3 230 m ²	Ecology: Fauna species	The initial clearance and construction activities might result in impacts on sensitive areas (such as river crossing impacts) or large-scale destruction and land clearance (TSF expansion	C, O	<p>The construction area should be well demarcated and construction workers should not enter adjacent areas.</p> <p>Any nests encountered should be avoided at all stages if encountered.</p> <p>Natural corridors, such as the non-perennial drainage lines should be protected and avoided during the infrastructure placement and</p>



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			footprint) will be required including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.		<p>activities, except where it cannot be avoided and impacts rehabilitated in terms of approved rehabilitation plans to avoid impacts on the ecological and surface water environment.</p> <p>To minimise 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.</p> <p>Continuous rehabilitation of the area should occur during construction, where revegetation practices should enjoy priority.</p>
Development of pipelines	3 230 m ²	Ecology: Fauna species	Construction activities, constant movement on and around the terrain with heavy construction vehicles might result in compaction of the soil and destruction of other vegetation habitat which will impact on the animals that use the area as habitat. Storing of foreign materials, such as construction material, mixing of concrete or collection and delivering could result in pollution. The remaining natural areas will be severely impacted if not managed well. Construction will result in increase of potentially destructive movement along the road where the pipeline is proposed.	C, O	<p>Regular monitoring and maintenance should form part of the pipeline's management to ensure no leakages or spillages reach the natural environment.</p> <p>To minimise 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.</p> <p>Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should enjoy priority.</p> <p>Seed mixes should match the surrounding vegetation structures and those species specifically found in Marikana Thornveld vegetation group.</p>
Development of pipelines	3 230 m ²	Ecology: Fauna species	The drainage system where the river crossing will occur may be impacted due to construction activities which may result in the destruction or degradation of riparian habitat for sensitive	C, O	<p>Waste management should be implemented as specified within the EMP (to be approved) and this should focus on aspects such as construction management, leakage detection, monitoring and regular maintenance.</p> <p>Corridors between the drainage channels and river systems should always be maintained during construction and operational phases.</p>



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			species. Other operational issues related to the pipeline also include possible spillage and leakages of the slurry.		Alien and Invasive management should extend to the route along the pipeline to ensure invasive species do not get foothold along the proposed route and spread into the surrounding landscape as a result.
Operation of pipelines	3 230 m ²	Ecology: Fauna species	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. From the field assessment, it seems that a number of indirect impacts have already impacted the surrounding terrain.	O	Animals may get used to movement by people in designated areas if it is a predictable situation. If movement is allowed into natural areas on a regular basis and the smell and sound of humans are found outside the demarcated development zones, it may result in animals moving away from the area and those that have specialised niches may flee and starve due to limited range and adaptability.
					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 that may decrease the integrity of the vegetation types as a specialised habitat for animals.
					Noise impacts should be monitored and kept in accordance with the regulated standard prescribed for the zoning of the area.
					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 of the rivers downstream during a rain event. This should be prevented by storing hazardous wastes in bunded or appropriately lined areas. Domestic waste and other waste should be managed in the appropriate manner and apply good housekeeping practices will aid this issue.
					Strict rules should be adhered to and applied to offenders entering the natural environment outside of the footprint without permission.
Decommissioning of pipelines	3 230 m ²	Ecology: Fauna species	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the	CI, Post CI	Existing pathways should be clearly demarcated and be kept to. It is important that animals (wildlife and domestic animals) are not handled, removed, killed or interfered with.



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			area if adherence is not in-line with the Environmental Management Programme (EMPr) and Final Rehabilitation programme compiled for the specific Mooinooi mining and Lesedi treat and reclamation areas.		<p>Activities must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962).</p> <p>Rehabilitation of degraded areas is compulsory and should include the pipeline and river crossing established as part of the pipeline development.</p> <p>When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas, especially for mammalian species within the area.</p> <p>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.</p>
Development and decommissioning of the pipeline	3 230 m ²	Groundwater quality	Impact on water quality as a result of hydrocarbon spills from machinery used in the construction.	C, Cl, Post Cl	<p>Ensure that vehicles are maintained.</p> <p>Clean spills / leaks from machinery immediately and dispose to Hazardous waste bins for collection and removal to suitable waste site</p>
Development of the pipeline	3 230 m ²	Groundwater quantity	Impact on the groundwater levels as a result of construction and operation	C, O, Cl, Post Cl	No impact expected
Operation of the Tailings and return water pipelines	3 230 m ²	Groundwater quality	Impact as a result of tailings spill or return water spills from the pipeline could impact on groundwater quality, especially near watercourses	O	<p>Inspect pipeline route on a daily basis.</p> <p>Repair pipeline immediately.</p> <p>If the spill is from the tailings pipeline, remove affected soil and dispose to the Tailing storage faculty or a suitable waste bin for removal and disposal to a suitable waste landfill site.</p> <p>Inform the DWS (and if needed, DEAT and DMRE) about the spill immediately, within 14 days submit an Incident report outlining how the impacted areas was rehabilitated.</p>
Construction of the pipeline	40 m ²	Surface water	Vegetation removal 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	C	<p>Finalise design and site layout plan before construction commence.</p> <p>Delineate area to be cleared</p> <p>Commence and finalise vegetation clearance during the dry season</p>



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			habitats created by the existing diversion would be altered.		
Construction of the pipeline	40 m ²	Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	C	Should any excavation be needed do so during the dry season.
Construction of the pipeline	40 m ²	Surface water	The potential for hydrocarbon spills from machinery is a possibility.	C	No vehicles to overnight at the construction area.
					Machinery to overnight in dedicated area near workshop.
					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.
Pumping of tailings slurry	40 m ²	Surface water	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.	O	Inspect the pipeline on a daily basis and repair any areas immediately.
					Clear spilled slurry from the watercourse.
					Remove any spilled material immediately and dispose to the TSF.
Pumping of Return water	40 m ²	Surface water	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. High velocity spills from the pipe could result in erosion of the bank of the watercourse which would add to siltation and result in negative	O	Inspect the pipeline on a daily basis and repair any areas immediately.



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			impacts on the habitat, water quality and biota.		
Removal of pipelines	40 m ²	Surface water	Hydrocarbon spills from machinery making use of the existing access road may impact on surface water quality.	CI	Refer to measures under Vegetation Clearance.
Removal of pipelines	40 m ²	Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	CI	Refer to measures above.
All existing activities, opencast mining, underground mining, mineral beneficiation, offices, etc. in addition to proposed new infrastructures.	40 m ²	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	C	Refer to management measures as outlined above.
	40 m ²	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	O	Refer to management measures as outlined above.
All existing activities, opencast mining, underground mining, mineral	Cumulative impact	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	CI, Post CI	Refer to management measures as outlined above.



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
beneficiation, offices, etc. in addition to proposed new infrastructures.					
Transport of materials and labour	3 230 m ²	Soils: Erosion	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	C	Minimise the footprint of the infrastructure expansion: The pipeline layout and design are aiming to minimise the area to be occupied by mine infrastructure to as small as practically possible. All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase. Management and supervision of construction teams: The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site. In addition, compliance to these instructions must be monitored.
Vehicle movement	3 230 m ²	Soils: Compaction	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduces the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers is often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project. The areas to be compacted where surface infrastructure will be constructed. Wet soil is more prone to compaction when there is heavy equipment and vehicles traversing over it.	C	Terrain stability to minimise erosion potential: Management of the terrain for stability by using the following measures will reduce the risk of erosion significantly: <ul style="list-style-type: none"> • Using appropriate methods of excavating that are in accordance with regulatory requirements and industrial best practices procedures; • Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; and • Using drainage control measures and culverts to manage the natural flow of surface runoff. Management of access and service roads: Existing established roads will be used wherever possible. The moisture content of access road surface layers must be maintained through routine spraying or the use of an appropriate dust suppressant. Access roads must be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts will
Vehicle movement	3 230 m ²	Soils pollution	During construction, vehicles and equipment will traverse the site	C	



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.		be installed to permit free drainage of existing water courses. The side drains on the roads to be used must be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events and where necessary geo-membrane lining can be used. Prevention of soil contamination: During the construction phase, chemical soil pollution should be minimised as follows:
Topsoil removal	3 230 m ²	Disturbance of soil horizon organisation	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture. This reduces the fertility of the soil through the disturbance (and sometimes destruction) of the soil nutrient cycles as well as the hydro-pedological functioning of the soil profiles.	C	<ul style="list-style-type: none"> • Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained by using a drip tray with plastic sheeting filled with absorbent material; • Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area; • Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste; • Containing potentially contaminating fluids and other wastes; and • Cleaning up areas of spillage of potentially contaminating liquids and solids.
Construction of pipelines	3 230 m ²	Change in land capability	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing/arable and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	C	
The operational phase	3 230 m ²	Soil erosion	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially	O	Soil management should be an on-going strategy through the operational phase as soil disturbing activities will continue in areas



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
includes all the processes associated with the daily maintenance of the proposed new infrastructure			during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion		where operation of the mine continues and new areas are developed through operation activities. Disturbed sites must be rehabilitated as soon as they have reached the end of their life. During operations, soil will continue to be removed from newly developed areas and stockpiled for later use. Topsoil stripping and stockpiling should follow the guidelines as stipulated under the construction phase above. Stockpiles should be re-vegetated immediately to prevent erosion and resulting soil losses from these stockpiles. It is recommended that vegetation removed during land clearance be composted (after seed was harvested to serve as a seed bank for the indigenous vegetation present) during the operational phase and that this compost be used as a soil ameliorant for soil rehabilitation purposes.
Vehicle movement	3 230 m ²	Soil Compaction	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	O	All above soil management measures explained under the Construction Phase should be maintained for similar activities during the Operational Phase. In addition to this, the following Soil Management Measures are recommended:
Vehicle movement	3 230 m ²	Soil Pollution	During the operational phase of these infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.	O	<ul style="list-style-type: none"> • The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). • Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams. • Routine monitoring will be required in and around the sites. <p>12.2.1 Management of potential soil contamination during the operational phase.</p> <p>The following management measures will either prevent or significantly reduce the impact of soil chemical pollution on site during the operation phase:</p> <ul style="list-style-type: none"> • Stockpiles are managed so they do not become contaminated and then need additional handling or disposal; • A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled;



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
					<ul style="list-style-type: none"> • Processing areas should be contained and systems designed to effectively manage and dispose of contained storm water, effluent and solids; • Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater; • Equipment, and vehicle maintenance and wash-down areas, are contained and appropriate means provided for treating and disposing of liquids and solids; • Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems); • Solids and slurries are disposed of in a manner consistent with the nature of the material and avoids contamination; and • Effluent and processing drainage systems avoid leakage to ground.
Decommissioning and rehabilitation	3 230 m ²	Soil erosion	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	CI, Post CI	<p>At decommissioning any excavated areas will be backfilled and covered with a layer of topsoil. Some re-grading and re-contouring will be carried out. Soil management in the decommissioning phase will include the following:</p> <ol style="list-style-type: none"> <i>1. Management and supervision of decommissioning teams</i> The activities of decommissioning contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict decommissioning workers to the areas demarcated for decommissioning. In addition, compliance to these instructions must be monitored. <i>2. Infrastructure removal</i> All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site. <i>3. Site preparation</i> Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (sloped) in order to approximate the pre-project aspect and contours. The previous
Vehicle movement	3 230 m ²	Soil Compaction	The pipeline materials will be transported away from site in the decommissioning phase. Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	CI, Post CI	



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
Vegetation establishment	3 230 m ²	Change in land capability	As decommissioning commences, pipeline will be removed from the surface and indigenous vegetation will be established where possible. This will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time	CI, Post CI	<p>infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles.</p> <p>4. Seeding and re-vegetation Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible. The vegetative cover reduces erosion potential, slows down runoff velocities, physically binds soil with roots and reduces water loss through evapotranspiration. Indigenous species will be used for the re-vegetation, the exact species will be chosen based on research available and then experience as the further areas are revegetated.</p> <p>5. Prevention of soil contamination During the decommissioning phase, chemical soil pollution should be minimised as follows:</p> <ul style="list-style-type: none"> • Losses of fuel and lubricants from the oil sumps of vehicles and equipment should be contained using a drip tray with plastic sheeting and filled with absorbent material; • Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids and recovering contaminated soils and treating them off-site; • Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste; • Containing potentially contaminating fluids and other wastes; and • Cleaning up areas of spillage of potentially contaminating liquids and solids. <p>6. Soil management during the closure phase During the closure phase activities include the maintenance and aftercare of final rehabilitated land. In this regard, frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gullies have developed. In the event that vegetation has not re-established and erosion gullies have developed, remedial action should be taken</p>
Construction of pipelines	3 230 m ²	Visual impact: Exposure rating	The construction of the proposed Mooinooi project with its associated infrastructure will	C	The visual impact can be minimized creating visual barriers. The construction area will be cleared as soon as construction of the



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
			increase the cumulative visual impact of mining type infrastructure within the region. In context of the mining and light agricultural activities, the construction phase of the Mooinooi structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable.		infrastructure is finished. Disturbing only the vegetation as necessary.
Construction of pipelines	3 230 m ²	Visual impact on users of roads and land users	Permanent visibility of the pipeline on users of the road and land users	O	<p>The visual impact can be minimized by the creation of visual barriers.</p> <p>Planting indigenous vegetation.</p> <p>Clearing only vegetation as required.</p> <p>Rehabilitating any disturbed areas as soon as possible.</p> <p>Painting The pipeline natural colours.</p>
Construction of the pipelines	3 230 m ²	Socio-Economic impact	A brief positive impact on local income as more people will be employed during the construction and decommissioning phases of the pipeline	C, CI	N/A Positive impact
Operation of the pipelines	3 230 m ²	Socio-Economic impact	The use of the pipeline will allow the continuation of the Lesedi tailings retreatment plant and ensure that current employment opportunities are maintained. An indirect effect of the continuation of the tailing retreatment is that the tenders issued by the tailing retreatment contactor is preferentially given to local small and medium enterprises which ensure a positive impact with regards to employment in the area.	O	N/A Positive impact



Activity	Size and Scale of disturbance	Aspects affected	Potential Impact	Phase	Mitigation measures
Operation of the pipelines	3 230 m ²	Crime and safety	As the proposed pipeline will be located within the existing road reserve for as far as possible should deter thieves from damaging and vandalising the pipeline due to traffic in this area. The area of concern is the portion of the pipeline that will not be as heavily traffic, this area may be prone to vandalism and theft and this could have an impact on the socio-economic situation of the area as well as the safety of the local residents and security personnel in the area.	O	Bury the pipeline in the areas that does not fall within the road reserve.
					Conduct inspections along the pipeline route and ensure that the time and frequency of these inspections are random.
Construction, operation and decommissioning of the pipelines	3 230 m ²	Heritage / archaeological	None, no sites identified	C, O, CI, Post CI	N/A
	3 230 m ²	Geology	None, limited impact only on footprint area and most of the pipeline will be on surface		N/A
	3 230 m ²	Topography	None, limited impact only on footprint area and most of the pipeline will be on surface		N/A



Table 5-2: Impact Management Actions

Aspects affected	Potential Impact	Aspects affected	Type of management	Compliance with Standards	Time period for implementation
	<i>(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, Groundwater contamination, air pollution etc.....etc...)</i>			<i>(A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)</i>	<i>Describe the time period when the measures in the environmental management programme must be implemented. Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- ..Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.</i>
Ecology: Flora Diversity	Impact on overall floral diversity: Development related activities will lead to destruction of moderately to heavily modified habitat 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.	Ecology: Flora Diversity	Planning, Active Control	Natural Vegetation across the development footprint	During all phases of development
Ecology: Flora Diversity	Flora diversity due to exotic and invasive plant species: 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.	Ecology: Flora Diversity	Planning, Active Control	Natural Vegetation across the development footprint	During all phases of development
Ecology: Flora Species of conservational concern	Impact on floral species of conservation concern due to destruction of sensitive habitats: Development related activities may lead to the loss of floral species of conservation concern. Fourteen (14) species listed for the area are classified as species of conservation concern and may potentially occur on the project footprint. However, no flora SCC were observed to occur on the project footprint and 200 m project buffer during the site survey. Development and related activities could impact on the sensitive habitats related to the watercourses situated on and around the project footprint.	Ecology: Flora Species of conservational concern	Planning, Active Control	Natural Vegetation across the development footprint	During all phases of development



Aspects affected	Potential Impact	Aspects affected	Type of management	Compliance with Standards	Time period for implementation
Ecology: Flora species	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	Ecology: Flora species	Planning, Active Control	Natural Vegetation across the development footprint	During all phases of development
Ecology: Fauna species	The initial clearance and construction activities might result in impacts on sensitive areas (such as river crossing impacts) or large-scale destruction and land clearance (TSF expansion footprint) will be required including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.	Ecology: Fauna species	Planning, Active Control	Protection and reduced impacts of fauna species	During all phases of development
Ecology: Fauna species	Construction activities, constant movement on and around the terrain with heavy construction vehicles might result in compaction of the soil and destruction of other vegetation habitat which will impact on the animals that use the area as habitat. Storing of foreign materials, such as construction material, mixing of concrete or collection and delivering could result in pollution. The remaining natural areas will be severely impacted if not managed well. Construction will result in increase of potentially destructive movement along the road where the pipeline is proposed.	Ecology: Fauna species	Planning, Active Control	Protection and reduced impacts of fauna species	During all phases of development
Ecology: Fauna species	The drainage system where the river crossing will occur may be impacted due to construction activities which may result in the destruction or degradation of riparian habitat for sensitive species. Other operational issues related to the pipeline also include possible spillage and leakages of the slurry.	Ecology: Fauna species	Planning, Active Control	Protection and reduced impacts of fauna species	During all phases of development
Ecology: Fauna species	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. From the field assessment, it seems that a number of indirect impacts have already impacted the surrounding terrain.	Ecology: Fauna species	Planning, Active Control	Protection and reduced impacts of fauna species	During all phases of development



Aspects affected	Potential Impact	Aspects affected	Type of management	Compliance with Standards	Time period for implementation
Ecology: Fauna species	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Programme (EMPr) and Final Rehabilitation programme compiled for the specific Mooinooi mining and Lesedi treat and reclamation areas.	Ecology: Fauna species	Planning, Active Control	Protection and reduced impacts of fauna species	During all phases of development
Groundwater quality	Impact on water quality as a result of hydrocarbon spills from machinery used in the construction.	Groundwater quality	Maintenance, Active control	Vehicles Maintained and pollution prevented	During all phases of development
Groundwater quality	Impact as a result of tailings spill or return water spills from the pipeline could impact on groundwater quality, especially near watercourses	Groundwater quality	Inspections, Maintenance, Active control, Rehabilitation	Vehicles Maintained and pollution prevented. No pollution.	During all phases of development
Surface water	Vegetation removal 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	Planning, Active control	Resource quality objectives as promulgated	During all phases of development
Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	Surface water	Planning, Active control	Resource quality objectives as promulgated	During all phases of development
Surface water	The potential for hydrocarbon spills from machinery is a possibility.	Surface water	Planning, Active control	Resource quality objectives as promulgated	During all phases of development
Surface water	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	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development
Surface water	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. High velocity spills from the pipe could result in erosion of the bank of the watercourse which would add to siltation and result in negative impacts on the habitat, water quality and biota.	Surface water	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development



Aspects affected	Potential Impact	Aspects affected	Type of management	Compliance with Standards	Time period for implementation
Surface water	Hydrocarbon spills from machinery making use of the existing access road may impact on surface water quality.	Surface water	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development
Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	Surface water	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development
Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	Surface water	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development
Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	Surface water	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development
Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	Surface water	Planning, Inspections, Maintenance	Resource quality objectives as promulgated	During all phases of development
Soils: Erosion	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	Soils: Erosion	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soils: Compaction	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers is often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project. The areas to be compacted where surface infrastructure will be constructed. Wet soil is more prone to compaction when there is heavy equipment and vehicles traversing over it.	Soils: Compaction	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soils pollution	During construction, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	Soils pollution	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development



Aspects affected	Potential Impact	Aspects affected	Type of management	Compliance with Standards	Time period for implementation
Disturbance of soil horizon organisation	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture. This reduces the fertility of the soil through the disturbance (and sometimes destruction) of the soil nutrient cycles as well as the hydro-pedological functioning of the soil profiles.	Disturbance of soil horizon organisation	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Change in land capability	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing/arable and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	Change in land capability	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soil erosion	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion	Soil erosion	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soil Compaction	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	Soil Compaction	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soil Pollution	During the operational phase of these infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.	Soil Pollution	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soil erosion	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	Soil erosion	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Soil Compaction	The pipeline materials will be transported away from site in the decommissioning phase. Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	Soil Compaction	Planning, Inspections, Maintenance, Active control	Soil suitable for the final land use	During all phases of development
Change in land capability	As decommissioning commences, pipeline will be removed from the surface and indigenous vegetation will be established where possible. This will result in improved soil conditions over time,	Change in land capability	Planning, Inspections,	Soil suitable for the final land use	During all phases of development



Aspects affected	Potential Impact	Aspects affected	Type of management	Compliance with Standards	Time period for implementation
	permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time		Maintenance, Active control		
Visual impact: Exposure rating	The construction of the proposed Mooinooi project with its associated infrastructure will increase the cumulative visual impact of mining type infrastructure within the region. In context of the mining and light agricultural activities, the construction phase of the Mooinooi structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable.	Visual impact: Exposure rating	Active control, Rehabilitation	No visual impact	During all phases of development
Visual impact on users of roads and land users	Permanent visibility of the pipeline on users of the road and land users	Visual impact on users of roads and land users	Active control, Rehabilitation	No visual impact	During all phases of development
Crime and safety	As the proposed pipeline will be located within the existing road reserve for as far as possible should deter thieves from damaging and vandalising the pipeline due to traffic in this area. The area of concern is the portion of the pipeline that will not be as heavily traffic, this area may be prone to vandalism and theft and this could have an impact on the socio-economic situation of the area as well as the safety of the local residents and security personnel in the area.	Crime and safety	Active control	No opportunity for burglary	During all phases of development



6 FINANCIAL PROVISION

6.1 Determination of the amount of Financial Provision

Please refer to Section 22 of Part A.

6.2 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.

Samancor Mooinooi Section and the Lesedi tailing retreatment plant closure and rehabilitation objectives are in line with the Mineral and Petroleum Resources Development Act and certain of its subsequent amendment speak to the requirement for accurate and appropriate financial provision for the environmental rehabilitation and closure of mining operations. This estimate serves to advise the responsible legal entities of the proper provision, with specific reference to Government Gazette, 20 November 2015, Chapter 2 (Financial Provision) Paragraph 5 (Scope of financial provision), which reads:

An applicant or holder of right or permit must make financial provision for –

- a) rehabilitation and remediation;
- b) decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and
- c) remediation and management of latent or residual environmental impacts which may become known in the future, including the pumping and treatment of polluted or extraneous water.

The following rehabilitation and closure objectives will be applicable for the effective and efficient long-term management of residual impacts:

- Create a long-term ecologically stable and self-sustaining system;
- Minimise the disturbance of any ecological sensitive system in the short-term;
- Meet with prevailing environmental legal requirements; and
- Prevent / minimise negative impacts as identified in this report.

This process allows the project management team to identify significant environmental features that should be addressed as a priority during the future operational, decommissioning and post closure phases of the project.

The process will also take into account the cost and time of undertaking such analysis and the availability of reliable data. The process to identify significant environmental aspects associated with the project activities shall, where relevant consider the following:

- Releases to Water;
- Waste Management;
- Contamination of Land;
- Noise Control;
- Use of Raw Materials and Natural Resources;
- Local Environmental and Community Issues; and
- Visual Impact Control.

Mooinooi Section undertakes to continually develop and implement procedures that will ensure that all the project activities are thoroughly addressed to make sure that project defined objectives are met. Specific project plans shall be available that identify and plan activities needed to achieve project objectives.



7 CONFIRM SPECIFICALLY THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNER AND INTERESTED AND AFFECTED PARTIES

Environmental objectives in relation to closure will be consulted with the landowners and interested and affected parties during the public participation process.

8 PROVIDE A REHABILITATION PLAN THAT DESCRIBES AND SHOWS THE SCALE AND AERIAL EXTENT OF THE MAIN MINING ACTIVITIES, INCLUDING THE ANTICIPATED MINING AREA AT THE TIME OF CLOSURE.

The following rehabilitation actions will be implemented with regards to the proposed pipelines (2 940 m²).

- Remove all pipelines above ground and buried as applicable.
- For buried sections replace topsoil and seed.
- For pipeline on surface confirm topsoil presence and replace and seed if needed.
- Pipes will be salvaged and re-used as far as possible

8.1 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

Removal of the pipelines will return the environment back to the pre-construction condition and any environmental impacts will be removed.

8.2 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

Please refer to Part A, Section 22.

8.3 Confirm that the financial provision will be provided as determined.

Financial provision will be provided as determined.



9 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*

See Section 14.3 for the specialist proposed detailed monitoring programmes.

Table 9-1: Mechanism for monitoring. Phases: C= construction; O= Operational; Cl: Closure

Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
Development of pipelines	Ecology: Flora Diversity	Impact on overall floral diversity: Development related activities will lead to destruction of moderately to heavily modified habitat 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.	C, O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist
Development of pipelines	Ecology: Flora Diversity	Flora diversity due to exotic and invasive plant species: 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.	C, O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist
Development of pipelines	Ecology: Flora Species of	Impact on floral species of conservation concern due to destruction of sensitive	C, O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
	conservational concern	habitats: Development related activities may lead to the loss of floral species of conservation concern. Fourteen (14) species listed for the area are classified as species of conservation concern and may potentially occur on the project footprint. However, no flora SCC were observed to occur on the project footprint and 200 m project buffer during the site survey. Development and related activities could impact on the sensitive habitats related to the watercourses situated on and around the project footprint.					contractor, Samancor, Specialist
Closure / Post closure of pipelines	Ecology: Flora species	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	C, Post Cl	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist
Development of pipelines	Ecology: Fauna species	The initial clearance and construction activities might result in impacts on sensitive areas (such as river crossing impacts) or large-scale destruction and land clearance (TSF expansion footprint) will be required including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas	C, O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
		may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.					
Development of pipelines	Ecology: Fauna species	Construction activities, constant movement on and around the terrain with heavy construction vehicles might result in compaction of the soil and destruction of other vegetation habitat which will impact on the animals that use the area as habitat. Storing of foreign materials, such as construction material, mixing of concrete or collection and delivering could result in pollution. The remaining natural areas will be severely impacted if not managed well. Construction will result in increase of potentially destructive movement within the designated area along the road where the pipeline is proposed.	C, O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist
Development of pipelines	Ecology: Fauna species	The drainage system where the river crossing will occur may be impacted due to construction activities which may result in the destruction or degradation of riparian habitat for sensitive species. Other operational issues related to the pipeline also include possible spillage and leakages of the slurry.	C, O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist
Operation of pipelines	Ecology: Fauna species	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. From the field assessment, it seems that a number of indirect impacts have already impacted the surrounding terrain.	O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
Decommissioning of pipelines	Ecology: Fauna species	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Programme (EMPr) and Final Rehabilitation programme compiled for the specific Mooinooi mining and Lesedi treat and reclamation areas.	CI, Post CI	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Samancor, Specialist
Development and decommissioning of the pipeline	Groundwater quality	Impact on water quality as a result of hydrocarbon spills from machinery used in the construction.	C, CI, Post CI	During all phases of development	Visual site inspection	As needed	ECO, Tailings Retreatment contractor
Operation of the Tailings and return water pipelines	Groundwater quality	Impact as a result of tailings spill or return water spills from the pipeline could impact on groundwater quality, especially near watercourses	O	During all phases of development	Visual site inspection	As needed	ECO, Tailings Retreatment contractor
Construction of the pipeline	Surface water	Vegetation removal 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.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Construction of the pipeline	Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Construction of the pipeline	Surface water	The potential for hydrocarbon spills from machinery is a possibility.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Pumping of tailings slurry	Surface water	Spills from the pipeline would result in impacts on the water quality (should the tributary be flowing at the time). If spills	O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
		are not cleaned it could result in base flow water quality impacts. This in turn could impact on the habitat and the biota.					contractor, Specialist
Pumping of Return water	Surface water	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. High velocity spills from the pipe could result in erosion of the bank of the watercourse which would add to siltation and result in negative impacts on the habitat, water quality and biota.	O	During all phases of development	Visual site inspection	Daily	ECO, Tailings Retreatment contractor, Specialist
Removal of pipelines	Surface water	Hydrocarbon spills from machinery making use of the existing access road may impact on surface water quality.	Cl	During all phases of development	Visual site inspection	Daily	ECO, Tailings Retreatment contractor, Specialist
Removal of pipelines	Surface water	If the pipelines are buried, the resulting excavation would require vegetation removal and movement of soil within the beds and banks of the watercourse. This will have a negative impact on the habitat and flow regime of the watercourse which in turn will impact negatively on the water quality and biota.	Cl	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
All existing activities, opencast mining, underground mining, mineral beneficiation, offices, etc. in addition to proposed new infrastructures.	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
	Surface water	Significant changes have already occurred on the surface water resource as a result of the anthropogenic activities. The watercourses are fragmented and continuity has been compromised.	CI, Post CI	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Transport of materials and labour with trucks and buses	Soils: Erosion	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Vehicle movement	Soils: Compaction	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers is often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project. The areas to be compacted where surface infrastructure will be constructed. Wet soil is more prone to compaction when there is heavy equipment and vehicles traversing over it.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Vehicle movement	Soils pollution	During construction, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Topsoil removal	Disturbance of soil horizon organisation	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
		destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture. This reduces the fertility of the soil through the disturbance (and sometimes destruction) of the soil nutrient cycles as well as the hydropedological functioning of the soil profiles.					contractor, Specialist
Construction of pipelines	Change in land capability	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing/arable and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	C	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
The operational phase includes all the processes associated with the daily maintenance of the proposed new infrastructure.	Soil erosion	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion	O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Vehicle movement	Soil Compaction	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Vehicle movement	Soil Pollution	During the operational phase of these infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste	O	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
		generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.					
Decommissioning and rehabilitation	Soil erosion	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	CI, Post CI	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Vehicle movement	Soil Compaction	The pipeline materials will be transported away from site in the decommissioning phase. Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	CI, Post CI	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Vegetation establishment	Change in land capability	As decommissioning commences, pipeline will be removed from the surface and indigenous vegetation will be established where possible. This will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time	CI, Post CI	During all phases of development	Visual site inspection	Annual	ECO, Tailings Retreatment contractor, Specialist
Construction of pipelines	Visual impact: Exposure rating	The construction of the proposed Mooinooi project with its associated infrastructure will increase the cumulative visual impact of mining type infrastructure within the region. In context of the mining and light agricultural activities, the construction phase of the Mooinooi structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable.	C	During all phases of development	Visual site inspection	Once off	ECO, Tailings Retreatment contractor, Specialist



Activity	Aspects affected	Potential Impact	Phase	Time period for implementation	Monitoring method	Monitoring frequency	Person responsible for monitoring
Construction of pipelines	Visual impact on users of roads and land users	Permanent visibility of the pipeline on users of the road and land users	O	During all phases of development	Visual site inspection	Once off	ECO, Tailings Retreatment contractor, Specialist
Operation of the pipelines	Crime and safety	As the proposed pipeline will be located within the existing road reserve for as far as possible should deter thieves from damaging and vandalising the pipeline due to traffic in this area. The area of concern is the portion of the pipeline that will not be as heavily traffic, this area may be prone to vandalism and theft and this could have an impact on the socio-economic situation of the area as well as the safety of the local residents and security personnel in the area.	O	During all phases of development	Reporting of incidents to DWS, DMRE and South African Police (Mooinooi)	As needed	Tailings retreatment Contractor



10 INDICATE THE FREQUENCY OF THE SUBMISSION OF THE PERFORMANCE ASSESSMENT/ ENVIRONMENTAL AUDIT REPORT.

Performance assessment/ Environmental audit reports will be submitted every two years.

11 ENVIRONMENTAL AWARENESS PLAN

This EMPr will be made available to all appointed constrictors and sub-contractors for tender, construction, operational, and site investigation purposes.

The results of any site investigations will be provided to any contractors appointed to conduct alien invasive plant species removal.

Both Mooinooi Section and Lesedi section personnel will ensure receive training in the specific sites EMPr in addition to this EMPr and the Environmental awareness plan in those documents will be adhered too.

12 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

(Among others, confirm that the financial provision will be reviewed annually).

At present none requested.

13 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) that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein.

Signature of the environmental assessment practitioner:

Prescali Environmental Consultants (Pty) Ltd

Name of company:

Date:

14 REFERENCES

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15 APPENDICES

Appendix 1: Qualifications of EAPs

Appendix 2: C.V. of EAPs

Appendix 3: Locality Maps

- Local map
- Regional map (1:250000)

Appendix 4: Layout Plans

- 1:10000 – with location and areas
- Final Site map with sensitivities and buffer areas

Appendix 5: Public Participation Process

Appendix 6: Specialist Studies

Appendix 6. 1: Surface Water Impact Assessment

Appendix 6. 2: Soil and Land Capability Impact Assessment

Appendix 6. 3: Ecological Impact Assessment

Appendix 6. 4: Heritage Impact Assessment

Appendix 6. 5: Visual Impact Assessment

Appendix 6. 6: Patterson and Cook Control Philosophy document

Appendix 6. 7: Patterson and Cook Design Report

Appendix 7: Sylvania Closure costing

Appendix 8: Land claims information



Appendix 1: Qualifications of EAPs



Appendix 2: C.V. of EAPs



Appendix 3: Locality Maps



Appendix 4: Layout Plans



Appendix 5: Public Participation Process



Appendix 6: Specialist Studies



Appendix 7: Sylvania Closure costing



Appendix 8: Land claims information